Vulgar *and* Decimal
ARITHMETIC
Demonſtrated and Made Eaſie
TO THE
Meaneſt Capacity.

531. b. 2

By *THO. LYDAL.*

Accomptant to the Honourable
Commiſſioners of Her Majeſties
Revenue of **Exciſe.**

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BRITISH MUSEUM

TO HIS
Worthy Friend
Thomas Sadler,
Of the County of *Middleſex*,
GENT.
THIS
TRACT
(As a True Judge of the Subject
Treated of)
Is Dedicated,
and Preſented,
BY
The Author.

BRITISH MUSEUM

THE PREFACE.

A*Ltho' Treatiſes of* Arithmetic *are very Numerous, yet the Importunity of my Friends, (for whom this was only at firſt deſign'd) has been ſo prevailing, that* I *thought my ſelf oblig'd to publiſh the following* one, *not without Hope it may be* acceptable *to the* Curious, *as well as* Neceſſary, *and* Inſtructive *to the* meaneſt Capacity.

I have avoided every thing that appears either Trifling *or* Superfluous, *and omitted nothing that is really of* Uſe; Prolixity, *and an* Infinity *of* Rules, *are ſo far from* Inſtructing *the Reader, that it ſerves only to confound and fill him with Deſpair of ever arriving to the true Knowledge of this excellent*

excellent Art of Numbering.

The better to extricate all Lovers of this Art, *from the Difficulties they have hitherto undergone in attaining it, You have here not only the* Theory *but* Practic Part, *in the moſt* plain *and* eaſy Method *of any thing of this Nature yet extant.*

Theſe very Rules, *which I my ſelf (who for ſeveral Years have been and ſtill am in* Publick Buſineſs) *do* *practiſe*; *theſe* Rules *and no other but what my daily* Experience *perſuade me are abſolutely and eſſentially* Neceſſary, *I repreſent to your View and for the* Good *of the* Publick.

If you but truly and carefully peruſe this Treatiſe, *you'll have occaſion for no other* Inſtructions *to make you* perfect Maſters *in all manner of Buſineſs, in which* Numbers *are requir'd.*

If this finds a favourable

Reception, you may expect a Treatiſe of Book-keeping *more* Plain, *more* Eaſie, *and* Inſtructive *than any now Extant; wherein there ſhall not only be laid down* general Rules *for* Debtor *and* Creditor, *but theſe* Rules *ſhall all be reduc'd to* Practice, *methodiz'd and handled in the ſame manner, as is done in* Publick Offices, *and the beſt* Compting-houſes, *Not a ſuperficial Notion of* Debitor *and* Creditor, *as is generally taught and publiſhed, but ſuch a Treatiſe as ſhall give the* Reader *that true* Notion *of* *Buſineſs, as if he was actually bred in a* Compting-houſe *or in* Publick Buſineſs; *this, and in what elſe I can be further Serviceable to you, ſhall be the conſtant Endeavours of,*

Your Servant,

Tho. Lydal.

Vulgar and *Decimal*
ARITHMETIC
Demonſtrated and made Eaſie.
To the meaneſt CAPACITY.

CHAP. I.

Quantity is either **Continued** as a *Line* or *Magnitude*, and is the Subject of *Geometry*; or **Diſcrete**, as Multitude or Number, which is either an *Integer*, that is One, or an *Unite*, which is the leaſt Number, or a *Fraction*, *i. e.* a Part or Parts of an Unite, and is the Subject of *Arithmetic*. **Arithmetic**, (from the *Greek* word Ἀριθμὸς *Numerus)* may therefore be Defin'd the *Science* of **Diſcrete Quantity**; or as it relates to the Practice of it, **The Art of Numbering**.

It may be Divided into Four General Branches
Firſt, Numeral, or Common.
Secondly, Algebraical.
Thirdly, Logarithmecal.
Fourthly, Lineal or Inſtrumental.

The Firſt Comprehends all *Vulgar* and *Decimal* Numbers, and is the Subject of the following Treatiſe.

The Second makes uſe of Letters inſtead of Figures, and not only Solves any propos'd Queſtion, but gives a *General Theorem* or *Canon* for Solving all Queſtions of a like nature.

The Third conſiſts of *Artificial Numbers* (of which Tables are made) ſo contriv'd as to perform the moſt Laborious Operations of *Common Arithmetic* with Eaſe and Pleaſure.

The Fourth is by ſuch Numbers ſo plac'd on *Lines* and *Inſtruments*, as by applying a Pair of Compaſſes thereto, or by cauſing one Ruler to ſlide within another, great variety of Queſtions may be anſwer'd.

The Parts of *Common Arithmetic* are Five, *viz.*

Numeration, which Teacheth to Read and Value any given Number.

Addition, which finds the Sum of two or more Numbers.

Subtraction, which diſcovers the difference (whether Exceſs or Defect) between any two propos'd Numbers,

Multiplication, which gives the Product or Rectangle of any two Numbers.

Diviſion, which ſhews how to Divide a given Number into any Number of equal Parts.

Of which in their Order: Tho' the Four laſt are but a ſort of *Compounded Numeration*.

By putting ſeveral Unites together, new Numbers continually ariſe, The Characters or Figures by which all Numbers may be expreſs'd are Ten, *viz*.

Nine	Eight	Seven	Six	Five	Four	Three	Two	One	a Cypher, or Nought
9	8	7	6	5	4	3	2	1	0

Each of which (beſides its own ſingle Value) hath another Value according to its Place or Conjunction with another Number, or with a Cypher.

In every propos'd Number, there are as many Places as Figures. The Figure on the right hand is call'd the Firſt Place, and every Place from thence towards the left hand is Ten times more than that on the right,

A Figure in the Firſt Place ſignifies ſo many Unites as it contains, as 7 Signifies but Seven, in the Second Place with a Cypher, thus, 70, it ſignifies Seventy ; in the third Place thus, 700, it is Seven Hundred; in the fourth Place, thus 7000, it is Seven Thouſand, and ſo *ad infinitum*, in a *Decuple* or Ten-fold proportion.

When any Number of Figures are given to Read or Value, diſtinguiſh them into Periods, beginning at the Place of Unites, taking three Places to a Period, as in the following Table.

Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thouſands.	Tens of Thouſands.	Thouſands.	Hundreds.	Tens.	Unites.
9	8	7	6	5	4	3	2	1
3d Period			2d Period			1ſt Period		

Hence it appears the firſt Period is the Period of Hundreds, the ſecond is the Period of Thouſands, and the third is the Period of Millions.

The Figure 1 in the Firſt Place ſignifies One; the 2 in the Second Place ſignifies two Tens or Twenty; the 3 in the third place Three Hundred; the 4 in the fourth place Four Thouſand; the 5 in the Fifth Place Fifty Thouſand, *&c.* and all together make, Nine Hundred Eighty Seven Millions, Six Hundred Fifty Four Thouſand, Three Hundred Twenty One.

Suppoſing the Number 8754 is propoſed to be read: Beginning at the Right Hand proceed towards the left, ſaying Unites, Tens, Hundreds, Thouſands. By which you find the Figure 8 poſſeſſes the Place of thouſands; thus much of the Order. Now of the Value. You find 8 in the place of thouſands, 7 in the Place of hundreds, 5 in the place of tens, and 4 in the place of Unites, all which put together muſt be thus read, eight thouſand ſeven hundred fifty four.

And by this Method may any number of Figures (tho' never ſo many) be read or valued by repeating the ſame order over and over again, if the number of Figures exceed nine.

As for Example.

Millions of *Millions* of *Millions.*	Hundreds of thouſands of millions of millions.	Tens of thouſands of millions of millions.	Thouſands of millions of millions.	Hundreds of millions of millions.	Tens of millions of millions.	*Millions of millions.*	*Hundreds of thouſands of millions.*	Tens of thouſands of millions.	Thouſands of millions.	Hundreds of millions.	Tens of millions.	Millions.	*Hundreds of thouſands.*	Tens of thouſands.	Thouſands.	*Hundreds.*	Tens.	Unites.
6,	5	3	2,	6	7	4,	5	9	8,	4	3	2,	1	5	7,	8	[illegible]	6.

Obſerving that the Seventh Figure ſtands in the Place of Millions, the Seventh from that incluſive will be Millions of Millions, and the Seventh from thence Millions of Millions of Millions. *&c.* Which for brevity are better diſtinguiſh'd by the names of *Millions*, *Billions*, *Trillions*, *Quadrillions*, &c. But this is uſeleſs, it ſeldom or never happening that any Perſon can have occaſion to number more than nine Figures.

CHAP. II.

ADDITION

Of whole *Numbers.*

SO write down the Numbers given to be Added, that the Figures of like Place ſtand directly under each other, *viz.* Unites under Unites, Tens under Tens, Hundreds under Hundreds, *&c.* Then caſt up every Column together, beginning at the Unites, ſetting the Amount or Sum (if leſs then ten) under its reſpective Column; but if it caſt to ten, or any number of tens, with ſome over-plus, ſet down ſuch over-plus; and when there is none, ſet down a Cypher, and always reſerve one for every ten, to be carried to the next Column towards the left hand.

Example.

l.
5796
7964
9785

Total 23545 *l.*

To find the Total of the above Numbers, begin with the Column of Unites ſaying, 5 and 4 are 9, and 6 make 15, ſet down Five Unites and carry 1 Ten to the next Column, 1 carried and 8 are 9 and 6 are 15 and 9 make 24, ſet down 4 in the place of tens, and carry 2 tens forward, 2 and 7 are 9 and 9 are 18 and 7 are 25, ſet down 5 in the place of Hundreds, and carry 2 tens, 2 and 9 are 11 and 7 are 18 and 5 are 23, which being the laſt Column to caſt, ſet down 23, the Total will then be 23545. *l.*

Take another *Example*, viz.

l.
678
497
063
092

Total 1330 *l.*

Begin as before thus, 2, 3, 7 and 8 make 20, ſet down 0 and carry 2 to the next Rank of Figures, 2 carried, 9, 6, 9 and 7 make 33, ſet down 3 and carry 3 to the next Rank; 3 carried, 4 and 6 make 13, which ſet down, and the whole is 1330. *l.*

For a Proof, cut off one or more Lines from the top of your given Numbers, caſt up the reſidue excluſive thereof, then add what was cut off thereto, and if it makes the Firſt Total, you may be ſecure the work is true.

But the way Practis'd by moſt Accomptants is, Firſt to caſt upwards, as is already ſhew'd, and then to begin at the top and reckon downwards; if theſe two agree, they conclude their total is right.

Addition of *Money*.

It will very much aſſiſt a Learner in caſting up Money to get the following *Table* perfectly by heart.

Pence.		Shillings.
24		2
36		3
48		4
60		5
72		6
84	Make	7
96		8
108		9
120		10
132		11
144		12

He may alſo take notice, that Pounds, Shillings and Pence have uſually theſe marks ſet over them for diſtinction, *l. s. d.* and that

$\frac{1}{4}$		a Farthing.
$\frac{1}{2}$	ſtand for	a half Penny.
$\frac{3}{4}$		three Farthings.

He may alſo obſerve that 4 Farthings make a Penny, 12 Pence 1 Shilling, 20 Shillings 1 Pound. But this is ſo well known, that few Perſons are ignorant thereof.

When Numbers of ſeveral Denominations are to be added, each Denomination muſt be caſt up by it ſelf, and for ſo many of them as will make one of the next ſuperior Denomination, one muſt be carried forward. If the following Pounds, Shillings, Pence and Farthings were to be caſt up,

	l.	*s.*	*d.*
	25	7	6¼
	13	10	9
	10	11	4¾
	21	6	10½
	70	10	3¾
Total	141	6	10¼

Beginning with the farthings, I ſay 3 and 2 are 5 and 3 are 8 and 1 make 9, which becauſe it is 1 above 8 farthings or 2 pence, I ſet down the odd farthing, and carry the 2 pence to the next Column of pence, 2 I carry with 3, 10, 4, 9 and 6 make 34 pence, or 2 *s.* 10 *d.* ſet down the 10 pence, and carry 2 ſhillings to the Column of ſhillings, ſaying 2 carried with 10, 6, 11, 10 and 7 make 46 ſhillings. or 2 *l.* 6 *s.* ſet down the 6 ſhillings, and carry 2 pounds to the Column of pounds, and then proceed as before in whole numbers ſaying, 2 and 1 make 3 and 3 are 6 and 5 are 11, ſet down 1 and carry 1 to the next Column, 1 carried with 7, 2, 1, 1 and 2, amount to 14, which ſet down and the Total is 141 *l.* 6 *s.* 10¼ *d.* Or thus, for eaſe to the memory; when you have caſt the pence, go up the Column of ſhillings ſaying, 2 *s.* carried and (caſting the Uuites firſt) *6* is 8 and 1 is *9*, and *7* is *16*, then come down and ſay, *16* and 10 is *26*, and 10 is *36* and 10 is *46*, which is 2 *l.* *6 s.* ſet down the *6 s.* and carry the 2 *l.* as before.

Addition of *Troy-Weight*.

Note, 24 Grains are 1 Penny-weight, 20 Penny-weight 1 Ounce, and 12 Ounces 1 Pound. Hereby are weighed all precious Stones, Pearls, Gold, Silver, Corn, Bread, Liquors and Electuaries; and from hence all the Meaſures of wet and dry Commodities are taken.

Example.

	l.	*oz.*	*dwts.*	*gr:*
	54	10	15	17
	91	11	19	12
	10	7	16	10
Total	157	6	11	15

Beginning at the Grains ſay, 10 and 12 are 22, and 17 are 39, now becauſe 39 Grains make 1 Penny-weight and 15 Grains over, I ſet down 15 Grains and carry 1 for a Penny-weight; then ſay 1 that I carry and 16 are 17, and 19 are 36, and 15 are 51, now becauſe 51 Penny-weights make 2 Ounces and 11 Penny-weights, I ſet down 11 and carry 2 to the Ounces; 2 and 7 are 9 and 11 are 20 and 10 are 30 Ounces, which make 2 Pounds and 6 Ounces, for which ſet down 6 and carry 2 to the Pounds; ſaying 2 that I carried and 1 are 3 and 4 are 7, which ſet down (for you carry nothing in whole numbers when the amount is under 10, or in the leſſer Denomination when the Column caſt is leſs than one of them) then ſay 1 and 9 are 10, and 5 make 15, which ſet down being the laſt, and the Total is 157 Pounds, 6 Ounces, 11 Penny-weight and 15 Grains.

Addition of *Averdupoiz Weight.*

16 Ounces are 1 Pound, 28 Pounds 1 Quarter of a Hundred weight, 56 Pounds are 2 Quarters, 84 Pounds are 3 Quarters, 112 Pounds are 4 Quarters or 1 Hundred weight, and 20 Hundred weight are 1 Tun.

Note, *This Ounce is lighter than the Ounce* Troy *by* 42 *Grains in* 480, *that is nearly a* 12th *part; ſo that the* Averdupoiz *Ounce, which contains* 438 *Grains, is, to the Ounce* Troy, *which contains* 480 *Grains, as* 73 *to* 80.

Note alſo, *That by this Weight are weighed all ſorts of* Grocery-wares, Fleſh, Butter, Cheeſe Iron, Lead, Steel, Hemp, Flax, Tallow, Wax *&c.* all things whereof cometh Waſte or Garble Eight Pounds hereof among Butchers is call'd a Stone.

Take one *Example*, in which proceed as before,

	Tons.	*C.*	*qrs.*	*l.*	*oz.*
	16	11	1	11	11
	91	19	3	17	15
	91	11	2	11	14
	60	14	3	10	11
	31	11	2	11	13
	78	10	1	13	13
Total	370	19	2	21	13

SUB-

CHAP. III.

SUBTRACTION

Of Whole *Numbers*.

PLace the leſſer Number under the greater, in the ſame Order as in *Addition*, then begin at the right hand and *Subtract* each Figure below from that above, ſetting down the ſeveral *Remainders* underneath, which will be the *Remainder* or *Difference* of the two Numbers.

Example,

I.

89859 are Lent.
79648 are Paid.

10211 Remains due.

Say 8 from 9 there remains 1, 4 from 5 there remains 1, 6 from 8 there remains 2, 9 from 9 there remains 0, 7 from 8 there remains 1, all which ſet down underneath, which will be 10211: If nothing remain then write down a Cypher or 0. But if any Figure in the upper Number be leſs than the lower, borrow 1 that is a ten from the next Column, or call it 10 more than it is, and from thence take the lower Number, and place the remainder under the *Line*, and when you go to the next Figure pay one by adding it to the reſt, for the 10 you borrow'd before, and take that from the upper Number, as in the following ***Example.***

756295
178597

577698

Take 7 from 5 I cannot, but (adding 10 to it) 7 from 15 and there remains 8, then ſay 1 borrow'd and 9 (the next Figure below) make 10, from 9 I cannot, but 10 from 19 there reſts 9, one I borrow'd and 5 are 6 from 2 I cannot, but 6 from 12 there remains 6, one I borrow'd and 8 are 9, from 6 I cannot, but 9 from 16 there remains 7, 1 I borrow'd and 7 are 8 from 5 I cannot, but 8 from 15 there reſts 7, 1 I borrow'd and 1 are 2 from 7 there remains 5, which ſet down, and the difference is 577698.

Take another ***Example.***

l.
710200
320195

Remainder 390005

Proof 710200

5 from 0 I cannot, but 5 from 10 and there reſts 5, 1 I borrow'd and 9 are 10 from 0 I cannot, but 10 from 10 and there reſts 0, 1 borrow'd and 1 make 2 from 2 there remains 0, nought from 0 there remains 0, 2 from 1 I cannot, but 2 from 11 there reſts 9, 1 I borrow'd and 3 are 4, from 7 there reſts 3, which ſet down, and it makes 390005, the remainder.

Note, *That the number Subtracted added to the Remainder, will be equal to the Number from which the Subtraction was made*, as in the laſt *Example*, 320195 added to the Remainder 390005, are equal to 710200, which is the Proof for this Rule.

To give ſome Encouragement to the young *Scholar*, ſuppoſe an Army to conſiſt of 107650 Men,

That there were Slain	9871
Wounded	17652
Taken Priſoners	6452
And Deſerted	4110
I would know how many remain'd ſafe.	
The number of Slain, Wounded Taken and Deſerted	38085
Remains ſafe	69565
Proof	107650

Add the *Slain*, *Wounded*, *Taken* and *Deſerted* together, and then Subtract 'em from the Number the Army did conſiſt of, as you ſee in the *Example.*

Subtraction of *Money.*

This is alſo the taking the lower from the upper, which if leſſer, and you can't take it, then borrow one from the next *Column*, as in whole *Numbers* ; but with this caution, to value it according to the *Species* or *Denomination* of the *Column* from whence you take it.

1 *Example.*

	l.	*s.*	*d.*
Lent	254	13	4 ¾
Paid	53	9	2 ½
Remains due	201	4	2 ¼

2 *Ex.*	1653	2	1 ¼
	905	13	9 ½
	747	8	3 ¾

The firſt *Example* is eaſily perform'd, every lower Figure being leſs than that above it, the *Remainder* is 201 *l*, 4 *s*, 2 ¼ *d*.

The Second is thus perform'd, ſay ½ *d.* out of ¼ *d.* I cannot, but (borrowing 1 from the next *Denomination, i. e.* Pence) ½ *d.* out of 1 *d.* or 4 Farthings I borrow'd, and there reſts ½ *d.* which ½ *d.* and ¼ *d.* make ¾ *d.* again in the Pence, 9 *d.* and 1 *d.* I borrow'd are 10 *d.* from 1 *d.* I cannot, but 10 *d.* from 12 *d.* there remains 2 *d.* 2 *d.* and 1 *d.* are 3 *d.* So in the Shillings; 13 *s.* and 1 *s.* borrow'd make 14 *s.* from 20 *s.* or 1 Pound, reſts 6 *s.* 6 *s.* and 2 *s.* are 8 *s.* Then in the Pounds, 5 and 1 borrow'd make 6, from 3 I cannot, but 6 from 13 and there reſts 7, 1 borrow'd and 0 is 1 from 5 and there reſts 4, 9 from 6 I can't, but 9 from 16 and there reſts 7, the laſt Figure, and the *Remainder* is 747 *l.* 8 *s.* 3 ¾ *d.*

Examples.

	l.	*s.*	*d.*
Lent	576	12	6 ½
Paid	198	9	8 ¾
Remains	378	2	9 ¾

l.	*s.*	*d.*
700	0	0
699	19	11 ¾
000	0	0 ¼

In the firſt of theſe, I ſay 3 farthings from 2 farthings I can't, but 3 farthings from 4 farthings or 1 penny (borrow'd) and there reſts 1 farthing, and 2 farthings (out of which you could not take the 3 farthings) make 3 farthings, which ſet down, then 8 pence and 1 penny borrow'd are 9 pence, out of 6 pence I cannot, but 9 pence out of 12 pence or 1 ſhilling, and there remains 3 pence and 6 pence make 9 pence, then 1 borrow'd and 9 ſhillings are 10 ſhillings, from 12 ſhillings and there remains 2 ſhillings; 8 *l.* from 6 I cannot (for having borrow'd none in the Shillings you have none to Pay to the Pounds) but 8 from 16 there reſts 8, 1 borrow'd and 9 are 10 from 7 I cannot, but 10 from 17 and there reſts 7, 1 borrow'd and 1 are 2 from 5 and there reſts 3, which when ſet down, the *Remainder* is 378 *l.* 2 *s.* 9 ¾ *d.* In the next *Example* to this, you ſay 3 farthings from 4 farthings and there reſts 1 farthing, then 1 borrow'd and 11 are 12, from 0 you cannot, but 12 from 12 and there reſts 0, *&c.* Take theſe *Examples* for Practice.

	l.	*s.*	*d.*
Lent	7101	10	6 ½
Paid	1719	12	7 ¾
Remains	5381	17	10 ¾
Proof	7101	10	6 ½

501	19	8 ¼
179	10	11 ½
322	8	8 ¾
501	19	8 ¼

Subtraction of *Troy Weight.*

	l.	*oz.*	*dwts.*	*Gr.*
Deliver'd	19	7	10	20
Receiv'd back	16	10	15	10
Remains	2	8	15	10

In this *Example* I ſay. 10 from 20 there remains 10, 15 from 10 I cannot, but 15 from 20 penny-weights (an Ounce) and there remains 5, 5 and 10 are 15, 1 borrow'd and 10 are 11 from 7 I can't, but 11 from 12 there remains 1, 1 and 7 make 8, 1 borrow'd and 6 are 7 from 9 there Remains 2, 1 from 1 there remains 0, the Remainder is 2 *l.* 8 *oz.* 15 *dwts.* 10 *Gr.*

Subtraction of *Averdupoiz Weight.*

	Tun	C.	*Qr.*	*l.*	*oz.*
Bought	1	12	1	15	10
Sold	0	13	1	12	15
	0	19	0	2	11

ALL *Operations in* **Addition** *appear very Reaſonable, if we conſider but the Nature of* **Numeration** ; *In which all Numbers of more Places than One, every Figure contains ten times as much in value, as the next following toward the right Hand : Therefore where ſeveral Sums are rightly plac'd for* Addition, *ten in every Column toward the right Hand, makes but one in the next toward the left Hand ; ſo the number of tens we carry from one Column increaſing the next to which we add them, by ſo many Unites, will bring the Total anſwerable to our Demonſtration.*

And the Reaſon why having caſt up one Column, if the Sum amount to any Number above nine, we only ſet down a part in expreſs Figures, and bear the other in our Minds to the next, is, becauſe ten and all numbers greater, require two or more places to be expreſs'd in, whereas we are confin'd to one only, except in the laſt Column of the work.

In **Subtraction** *where the Figures above are greater, or contain more Unites in them than thoſe under, or to be* Subtracted *from them : The manner of working appears in its ſelf ſo evident, it needs no farther explanation. But many times a Figure below happens to be greater than that above it, and one muſt be borrow'd from the next Figure toward the left Hand in the upper Rank, to make it capable of* Subtraction, *which Method of proceeding is thus Demonſtrated : That Figure from which we borrow is thereby ſuppos'd to be diminiſh'd or made leſs by one ; then by adding one to the Figure under it, we increaſe the value of that, as* *much as the Figure above expreſſes more than what its real value is, by having one before taken from it,* &c.

And the Reaſon why an Unite borrow'd ſhall be call'd ten when added to the Figure on the right hand, hath been already diſcovered by the nature of Numeration. *This holds good in* Addition *and* Subtraction *of* Integers: *But when Numbers of different Species or Denominations are* Added *or* Subtracted, *the* Number *carried in* Addition *or borrow'd in* Subtraction, *muſt be conſider'd and valued according to the Species of that Column from whence it was taken.*

CHAP. IV.

MULTIPLICATION.

MULTIPLICATION is but a Compendium of *Addition*; for the number to be *Multiplied* is taken ſo often, as there are Unites in the Number *Multiplying*: Thus 5 *Multiplied* by 4 makes 20, which is,

5
5
5
5

Equal to 20 the Total of 4 times 5

The *Number* to be *Multiplied* is call'd the *Multiplicand.*

That by which you *Multiply* is call'd the *Multiplier.*

And what ariſes from the work the *Product.*

To *Multiply* by 2 is ſo eaſie as to need no aſſiſtance, there being ſcarce any Perſon but knows that twice 2 makes 4, twice 7 makes 14, or twice 9 makes 18, *&c.* But by higher Figures, it is abſolutely neceſſary to get the following Table perfectly by heart, both forward and backward, ſo as readily to anſwer to any part thereof without heſitation.

Multiplication *Table.*

3 times	3	are	9
	4		12
	5		15
	6		18
	7		21
	8		24
	9		27
4 times	4	are	16
	5		20
	6		24
	7		28
	8		32
	9		36
5 times	5	are	25
	6		30
	7		35
	8		40
	9		45
6 times	6	are	36
	7		42
	8		48
	9		54
7 tmies	7	are	49
	8		56
	9		63
8 times	8	are	64
	9		72
9 times	9	are	81

Here Note, If two Numbers are to be *Multiplied* by one another, you may make which you pleaſe the *Multiplier,* for 8 times 9 or 9 times 8 are the ſame; but for eaſe generally the leſſer Number is made the *Multiplier* and the great the *Multiplicand,* and are placed as in the following *Examples.*

Examples of *Multiplying* by a ſingle Figure.

Multiplicand	3475	7853	80709
Multiplier	4	5	6
Product	13900	39265	484254

1578	5496	45670
10	100	1000
15780	549600	45670000

In the firſt *Example,* and having learn'd the Table, ſay 4 times 5 are 20, ſet down 0 under the 5, and carry 2 forward for the Tens; then ſay 4 times 7 are 28, and 2 you carried are 30, ſet down 0, and carry 3; 4 times 4 are 16 and 3 you carried are 19, ſet down 9 and carry 1, then 4 times 3 are 12, and 1 you carried are 13, which ſet down, and the Product will be 13900.

By the ſame Method try the other *Examples;* which being very eaſie, I leave to the Learner to perform by himſelf.

Note, That whenever you are to *Multiply* by a Unite with any Number of Cyphers, as by 10, by 100, or by 1000, *&c.* you are only to add to the *Multiplicand*, one, two or three Cyphers, *&c.* as you may ſee in the fourth, fifth and ſixth *Examples.*

Becauſe a Cypher added to any Number of Figures, increaſeth them ten-fold, by adding a new Place, as was obſerv'd in the Article of *Numeration.*

Examples of *Multiplying* by ſeveral Figures.

```
  7293
    23
 ------
 21879
14586
 ------
167739
 ------
```

This is no harder to perform than by a ſingle Figure; only the work is ſomewhat longer, and care is requir'd in placing the Figures under one another, that is, Unites under Unites, Tens under Tens, *&c.* both before you *Multiply*, and in *Multiplying.*

Firſt, Say, 3 times 3 are 9, which ſet down; and becauſe it doth not amount to 10, nothing is to be carried to the next: Then ſay 3 times 9 are 27, ſet down the 7 and carry 2, then 3 times 2 are 6, and 2 you carried make 8, which ſet down;

and then ſay, 3 times 7 are 21, which being the laſt Figure, ſet it down; then proceed to *Multiply* by the ſecond Figure, *viz.* 2, ſaying twice 3 are 6, which you are to ſet down in the Place of tens, under the Figure 7 in the firſt Line; nothing being carried, go to the next Figure, and ſay, twice 9 are 18, then ſet down 8 and carry 1, then twice 2 are 4 and 1 you carried make 5, which ſet down: laſtly, twice 7 are 14, which ſet down, Add theſe two lines together, and you will find the Product to be 167739.

```
     7291346
        7524
   ---------
    29165384
   14582692
  36456730
 51039422
 -----------
 54860087304
 -----------
```

In this *Example*, having firſt *Multiplied* by the 4, *Multiply* by the 2, then by the 5, and laſtly by the 7, placing your Figures in the Operation directly under each Figure in your *Multiplier*; as you may obſerve above; the Product of your Second Figure in the *Multiplier* 2, is 2, whichſet in the Place of Tens, under that 2. of your Third Figure 5 is 0, which ſet in the Place of Hundreds under the 5, and the Product of your Fourth Figure 7 is 2, which ſet under the 7 in the Place of Thouſands; then Add them up, and you wiil find the Product to be 54860087304.

If either the *Multiplicand* or the *Multiplier*, or both, have one or more Cyphers on the right Hand, make the number that has the moſt Cyphers the *Multiplier*, and Place them as you ſee in the 2 following *Examples:* Then *Multiply* by the Figures, and to the Product Add ſo many Cyphers as were in the *Multiplier*,

456789
5700
319752300
2283945
2603697300

57800
15000
289000000
57800
867000000

When there are Cyphers in the *Multiplier* between the Figures; firſt *Multiply* by the Figure, and then underneath thoſe Cyphers, ſet down ſo many Cyphers, and proceed to *Multiply* by the next Figures, as in the following *Example*,

567893
3005
2839465
170367900
1706518465

When you are to *Multiply* by 2 Figures, which at ſight may be diſcover'd to be a Product of any other Figure, as ſuppoſe by 36, which is immediately diſcern'd to be made up of 6 times 6, or of 4 times 9, the ſhorteſt way is to *Multiply your given Number firſt by any one of thoſe Figures, and then that Product by the other*, as you may ſee in the following *Examples*, where the Products of 3759 *Multiplied* by 36 three ſeveral ways, are all the ſame, *viz.* 135324.

3759	3759	3759
6	4	36
22554	15036	22554
6	9	11277
135324	135324	135324

Thus inſtead of *Multiplying* by 72, I may do it by 8, and then by 9, becauſe 8 times 9 makes 72, and hereby the *Addition* of the two Lines are ſaved.

When you are to *Multiply* by any Number under 20, it may be perform'd in one Line by this Method, *viz.*

By *taking in* the right Hand Figure in *Multiplying*, as in the following *Example*. Say 6 times 8 is 48, ſet down 8 and carry 4. 6 times 4 is 24, and 4 is 28, and 8 the right hand Figure makes 36, ſet down the 6 and carry 3. 6 times 7 is 42, and 3 is 45, and 4 the right Hand Figure is 49, ſet down 9 and carry 4. 6 times 3 is 18, and 4 makes 22, and 7 the right Hand Figure makes 29, ſet down 9 and carry 2. then ſay 2 you carried and 3 makes 5, which ſet down, and the Work is finiſhed.

Example.

3748	3748
16	16
59968	22488
	3748
	59968

The beſt Proof *of* Multiplication *is* Diviſion, *viz.* *by* Dividing *the Product by the* Multiplier. *But this the Learner cannot know 'till he's Maſter of the next* Rule.

CHAP. V.

DIVISION.

DIVISION is a Compendium of *Subtraction*, whereby we leſſen a given Number ſo often as there are Units in another propos'd Number, and ſo divide it into any Number of equal Parts.

The Number to be *Divided* is called *the Dividend.*

That by which you *Divide*, the *Diviſor.*

And the *Anſwer* the *Quotient.*

Two things are always to be obſerv'd in *Diviſion*,

Firſt, *That you never ſet above* 9 *in the* Quotient *at once.*

Secondly, *That the Remainder muſt always be leſs than the* Diviſor.

Examples of *Dividing* by a ſingle Figure.

	Dividend.	
Diviſor	8) 961753	9) 846534
Quotient	120219 $\frac{1}{8}$	94059 $\frac{3}{9}$
Proof	961753	846534

In the Firſt *Example*, where the *Diviſor* is 8, I en-

enquire how many times 8 I can have in 9, which I find to be once; therefore I ſet down 1 under the 9, and carry the 1 that remains over and above to the 6, which makes it 16: I ſee that I can have twice 8 out of 16, and nothing remains, therefore I ſet down 2 under the 6. then I go to the 1, in which finding I cannot have 8, I ſet a 0 under the 1, and carry 1 to the next Figure, which makes it 17, in which I find there's twice 8, therefore I ſet down 2 under the 7, and carry the 1 that remains, which makes the next Figure 15. I perceive I can have but once 8 out of 15, therefore I ſet 1 under the 5, and carry the 7 that remains, which makes the laſt Figure 73, in which I find there is 9 times 8, therefore I ſet down 9 under the 3, and the *Diviſion* being finiſhed, I ſet the 1 that remains with the *Diviſor* underneath it thus, $\frac{1}{8}$. The *Quotient* is then 120219 $\frac{1}{8}$, and ſhews that One Hundred and Twenty Thouſand, Two Hundred and Nineteen times 8 are contained in the *Dividend*, and one Eighth part more; which if it had been perform'd by *Subtraction*, would have cauſed ſo many ſeveral Operations.

In the Second *Example*, where I *Divide* by 9, ſeeing I cannot have 9 out of the firſt Figure, which is 8, I make a Cypher, or rather a Point with my Pen underneath, and proceed to the next Figure, which by the 8 is made 84. I find I can have 9 times 9 herein, therefore I ſet down 9 under the 4, and the 3 that remains will make the next Figure 36, in which there being juſt 4 times 9, I ſet down 4 under the 6. In the next Figure 5 I ſee I cannot have 9, therefore I ſet down a 0 under the 5, and carry 5, which makes the next Figure 53. here I find I can have 5 times 9, therefore I ſet down 5 under the 3, and carry the 8 which remains forward, which makes the laſt Figure 84. in which I can have 9 times 9, therefore I ſet down 9 under the 4, and the 3 that remains at the end with the *Diviſor* underneath thus $\frac{3}{9}$. then is 94059 $\frac{3}{9}$ the Anſwer or *Qotient*.

To *Divide* any Number by a Unite with Cyphers, as by 10, 100, 1000, *&c.* it is done only by cutting off by a Line or Point, ſo many Figures on the right Hand in the *Dividend*, as there are Cyphers in the *Diviſor*; thoſe on the left hand being the *Quotient*, and thoſe cut off the *Remainder*, or *Fraction*, as in the following *Examples*.

1,0) 56327,8   1,00) 10756,84   1,000) 675,078

The Reaſon of this is very clear from the nature of Numeration, *where it was ſhew'd that a Cypher or Figure* Added *to any Number,* Increaſed *or* Multiplied *that Number ten-fold; and conſequently a Cypher or Figure cut off from the end of any number, leſſens it ſo much, by leſſening the Number of Places.*

To *Divide* by 2, is called halving a Number; and being of great *Uſe*, is perform'd as follows; tho' it might be omitted, becauſe he that underſtands the former *Examples*, cannot be at a loſs in this.

2) 578941

289470 $\frac{1}{2}$

Here I ſay the half of 5 is 2. which I ſet down underneath, and 1 that remains makes the next Figure 17, the half of 17 is 8, which I ſet down, and 1 that remains makes the next Figure 18. the half of 18 is 9, and nothing remains; therefore I ſet down 9. the half of 9, the next Figure, is 4, I ſet down 4, and 1 which remains makes the next 14. the half of 14 is 7, which I ſet down, and nothing remains; then the half of 1 is 0, and 1 remains, which I ſet down as before thus $\frac{1}{2}$, which ſhews that 28940 and $\frac{1}{2}$, is the Anſwer or Half of the Number 578941.

The Proof *of* Diviſion *is* Multiplication, *viz.* Multiply *the* Quotient *by the* Diviſor, *remembring to take in the* Remainder, *if there was any*; *and if the* Product *makes the* Dividend, *the Operation is true. See the firſt and ſecond* Examples.

Examples of **Dividing** by 2, 3 or more Figures.

Tho' the former way is beſt to *Divide* any Number by a ſingle Figure, yet to render *Diviſion* by ſeveral Figures the more eaſie, I will ſhew you another way, and which is the **beſt**, to *Divide* by many Figures; and what will always be uſed in this *Treatiſe*, when there is occaſion for ſuch a *Diviſion*.

Suppoſe 72649 were to be *Divided* by 3.

Firſt, I ſet down the *Dividend* and the *Diviſor* as before; underneath the *Diviſor* I draw a Line, under which I place the *Quotient*, which Place I prefer (tho' ſome place it at the end of the *Dividend*)

dend) becauſe it ſtands more readily to be *Multiplied* by the *Diviſor* to prove the work, and alſo more handſomly.

```
                      Dividend.
      Diviſor  3 ) 72649
      ———————      .....
                       .
      .....        12
Quotient, 24216     06
                     04
                      19
                      ———
                        1
                      ———
```

Finding that I can have the *Diviſor* in my firſt Figure 7, I make a point under it, and count how many Figures there are from thence incluſively, which in this *Example* are 5, *which ſhews that I am to have ſo many Figures in my* Quotient, and ſo many Operations, by *Multiplying* and *Subtracting*, and therefore I make 5 Points therein.

Then ſeeing I can have twice 3 out of 7, I ſet 2 in the firſt Place of the *Quotient*, then I *Multiply* the *Diviſor* thereby, and *Subtract* it from the 7, *viz*. twice 3 makes 6, from 7 there remains 1, which I ſet down under the 7.

Then I make a Point under the 2, and bring it down even with the 1 that Remain'd before.

Then I enquire how many times 3 are in 12, and I find 4 times, which 4 I ſet in the ſecond Place in the *Quotient*; then I *Multiply* it by the *Diviſor*, ſaying 4 times 3 make 12, and then *Subtract* it from 12, and there remains nothing, then I ſet a 0 under the 12.

Then I make a Point under the 6, and bring down the *6* even with the 0, and enquire how many times 3 in *6*, which I find to be twice, therefore I ſet down a 2 in the third Place of the *Quotient*, and *Multiplying* it by the *Diviſor*, I ſay twice 3 make *6*, which taken from *6*, nothing remains, therefore I ſet a 0 under the *6*.

Then I make a Point under the 4 in the *Dividend*, and bring it down by the 0. Then I enquire how many times 3 in 4, and I find once, which I ſet in the fourth Place of the *Quotient*; then I ſay, once 3 is 3, from 4 there remains 1, which I ſet under the 4.

Laſtly, I make a Point under the *9*, and bring it down under the 1, and being come to the end of all the Figures in my *Dividend*, I draw a Line underneath; then I ſay how many times 3 in 1*9*, which I find to be *6* times, which *6* I ſet in the fifth and laſt Place of my *Quotient*; then I *Multiply* by the *Diviſor*, ſaying *6* times 3 make 18 from 1*9*, there remains 1, which is 1 third, and ſo the *Diviſion* is finiſh'd.

Hereby you ſee the General Rule for *Diviſion*, is this, *Firſt*, **Find how many times the Diviſor is contain'd in the Dividend, then Multiply the Diviſor by the Quotient, and Subtract that Product from the Dividend.**

Some Perſons when they *Divide*, ſet the ſeveral Products of the *Diviſor* under the *Dividends*, and then *Subtract* them, as in the following *Example*, where the ſame Number is *Divided*.

Example 1.

```
                         Dividend.
           Diviſor 3 )7 2 6 4 9
           ---------   . . . . .
                             . .
           . . . . .     6
  Quotient 24216       -----
                        12
                        12
                       -------
                        006
                          6
                       -------
                          04
                           3
                         -------
                           19
                           18
                          -------
                             1  Remainder.
                          -------
```

But tho' this is a ſmall matter *Eaſier* to a Beginner, yet I would adviſe him to Practiſe the other way, as being much better and ſhorter, a multitude of uſeleſs Figures being inſerted in this way that are avoided in the other; and when the *Dividend* and *Diviſor* are very large, the work will run out to an unſeemly length.

Ex.

Example 2.

```
        37 ) 4 3 5 2 7
               . . . .
  . . . .    0 6 5
  1 1 7 6      2 8 2
                 2 3 7
                 -----
                   1 5  Remainder.
```

In this *Example*, I find that 37 may be had out of 43, therefore I ſet a Point under the 3, and counting the Figures of the *Dividend* from thence incluſive, I find I am to have 4 Figures in my *Quotient*, and accordingly I make 4 Points therein.

Then finding there is but once 37 in 43, I ſet 1 in the firſt Place of the *Quotient*, and *Subtract* the *Diviſor*, *viz*. once 7 from 3 I cant, but from 13 there remains 6, once 3 and 1 I borrow'd is 4, from 4 there remains 0.

I make a Point under the 5, and bring it down even with the 6 that remain'd, which makes it 65. Then ſeeing I can have but once 37 out of 65, I ſet another 1 in the ſecond Place of my *Quotient*, and *Subtract* again, *viz*. once 7 from 5 I can't, but from 15 there remains 8. once 3 and 1 I borrow'd is 4 from 6, there remains 2.

I make a Point under the 2, and bring it down even with the 28, which makes 282. Then I enquire how many times 37 in 282, and find 7 times, therefore I ſet 7 in the third Place of my *Quotient*. Then I *Multiply* my *Diviſor* by 7, and *Subtract* from the 282, *viz*. 7 times 7 is 49 from 2

I

can't, but from 52 (borrowing 50, or 5 Tens) there remains 3. Then 7 times 3 is 21, and 5 I borrow'd is 26 from 28, there remains 2.

Laſtly, I make a Point under the 7, and bring it down even with the 23 that remain'd, which makes 237. and then *I* draw a Line. Here I find I can have 37 but 6 times; therefore I ſet 6 in the fourth and laſt Place of the *Quotient*. Then I *Multiply* it into the *Diviſor*, and *Subtract* as before, *viz*. 6 times 7 is 42 from 7 I can't, but (borrowing 4) from 47, there remains 5. Then 6 times 3 is 18, and 4 I borrow'd makes 22, from 23, there remains 1. So the *Quotient* is, 1176 $\frac{15}{37}$, or 15 remains over.

Here Note, *That the* Remainder *is always of the ſame kind with the* Dividend.

To *Prove* this Sum. If you *Multiply* 1176 by 37, and take in the 15 that remain'd, you will find the *Product* will be 43527, the *Dividend*.

In *Dividing* by many Figures, it may alſo ſeem hard for beginners to diſtinguiſh at once, how many times a *Diviſor* of 3, 4, or more Figures is contain'd in the *Dividend*, or that part of it deſign'd for the Operation. For the removal of which ſeeming Difficulty, I ſhall endeavour to introduce the plaineſt and moſt eaſie Method of proceeding in ſuch Caſes, which obſerve in the following *Example*.

```
369) 187346
       ....
...  .2846
507
       263 Remainder.
```

In the *Firſt* Place, as has been ſhew'd before, I mark out by ſubſcribing a Point a convenient part of the *Dividend* for my firſt Operation. The Rule whereof (as I have intimated in the former *Examples*) is this. *I* obſerve how many Places there are in the *Diviſor*, then counting on ſo many Figures from the left hand in the *Dividend*, I underneath ſet my Point; but if I find the *Diviſor* can't be taken out of the like number of Figures in the *Dividend*, I go forward to one more, before I make my firſt Point, as in the *Example*; where the *Diviſor* being 369, I take 3 Figures of the *Dividend*, *viz*. 187. But ſeeing I can't have my *Diviſor* 369 in 117, I muſt proceed to the next Figure, which will make 1873, and there I fix the Point; then obſerve how many Figures are to be in the *Quotient*, as before directed. Having thus order'd the Sum for my firſt Operation, I proceed in manner following, avoiding the ſeeming Difficulty of determining at once how many times the *Diviſor* 369, in the *Example*, is contain'd in 1873, I demand how many times 3 I can have in 18, which I find to be *6* times. Then to try whether or no the whole *Diviſor* is 6 times contain'd in the *Dividend*, I *Multiply* the ſecond Figure of the *Diviſor* by that Number, and if the Product can be *Subtracted* from the ſecond Figure of the *Dividend*, with what remain'd of the firſt, after the firſt Figure of the *Diviſor* was ſo many times taken from it, I may conclude my Work right: Yet, if there is but little Remaining after this ſecond *Subtraction*, 'tis good to try the third Figure after the ſame manner, or perhaps the fourth, but 'tis very rare there is any occaſion for that.

And this is alſo to be remember'd in making three tryals, that you be ſure of taking the firſt Figure of the *Diviſor*, as often as the *Dividend* will admit, otherwiſe the Remainder will be more than the *Diviſor*, which is contrary to what has been before obſerv'd.

In the former *Example*, I begin with the Queſtion, How many times 3 can I have in 18? I try at *6* times, ſaying 6 times 3 is 18 from 18, there remains 0, then can I take *6* times *6*, which makes 36 from 7, finding I cann't, I ſee that *6* is too many, and therefore I take 5, ſaying, 5 times 3 is 15 from 18, there remains 3, then I ſay, 5 times *6* is 30 from 37 (made ſo by the 3 remaining from the firſt *Subtraction*) and there remains 7, wherefore I find that 5 will do; ſo I ſet down 5 in the *Quotient*, and proceed, *Multiplying* the *Diviſor* by the *Quotient*, and *Subtracting* the *Product* from the *Dividend*, according to the Firſt general Rules, ſaying 5 times *9* is 45 from 3 I can't, but from 53, there remains 8, which I ſet down under the 3. then 5 times *6* is 30, and 5 I borrow'd make 35 from 37, there remains 2, which being ſet down under the 7, I ſay 5 times 3 is 15, and 3 I borrow'd makes 18 from 18, there reſts 0. Then I make a Point under the 4, the next Figure in the *Dividend*, and bring it down even with the 28 that remain'd; and ſeeing *369* can't be taken out of 284, I ſet a 0 in the *Quotient*, and make a Point under the *6*, and bring it down even with the 284, and then draw a Line: Having ſo done, I enquire how often 3 is contain'd in 28, which I find is *9* times; but then (there being but 1 Remaining, which makes the next Figure 14) I ſee I can't have *9* times *6* in 14, wherefore I try at 8 times, ſaying 8 times 3 is 24 from 28, there remains 4, which makes the next Figure 44. Here I ſee again I can't have 8 times *6*, which is 48, from 44, therefore 8 times is likewiſe too much; but by taking notice of this laſt Tryal, I find 7 will do, and ſet it in the *Quotient*; ſaying 7 times *9* is *63* from *6* I can't, but from *66* and there remains 3, which I ſet down under the *6*. then I ſay 7 times *6* is 42, and *6* I borrow'd is 48 from 4 I can't, but from 54 there remains *6*, which I ſet under the 4, and ſay 7 times 3 is 21, and 5 I borrow'd is *26* from 28, and there remains 2, which I alſo ſet down, and the work is done: by which it appears that *369* is contain'd tain'd 507 times in 187346 and $\frac{263}{369}$ Parts more.

Example 2.

```
45679 ) 5843216
-----      • • •

 • • •   127531
 127     361736
         ------
          42983
         ------
```

In this *Example*, finding I can have the *Diviſor*, conſiſting of Five Places, *viz*. 45679, in the Firſt Five Figures of the *Dividend*, 58432, I make a Point under the 2, and then try how often I can take 4 in 5, which being no more than once, I make no farther proof, but ſet down 1 in the *Quotient*, and proceed, ſaying once 9 is 9, from 2 I can't, but 9 from 12, and there remains 3, which I ſet down under the 2. then ſay once 7 and 1 I borrow'd is 8, from 13 there remains 5, which I likewiſe ſet down under the 3. Once 6 and 1 I borrow'd is 7 from 14, and there remains 7, which being ſet down, I go on, ſaying, once 5 and 1 borrow'd is 6 from 8, there remains 2, then once 4 from 5, there remains 1, which I alſo ſet down. Then I bring down the 1 from the *Dividend* even with the remainder of this *Subtraction*, and begin my next Operation; enquiring how often I can have 4 in 12, and find it three times, and nothing remaining. Then perceiving I cannot have 3 times 5, which is 15, in 7, I find I can't have my *Diviſor* 3 times, and therefore I take 2. Now twice 4 is 8 from 12, there remains 4, which makes the next 47, and I ſee that I can have twice 5 therefrom, ſo I find 2 will do; therefore I ſet down 2 in the *Quotient*, I *Multiply* the *Diviſor* by it, and *Subtract* that *Product* from the *Dividend*, as in the former Operation; which having done, I make a Point under the 6 in the *Dividend*, and bring it down even with this laſt remainder, and then begin as formerly; ſaying, How many times 4 in 36? I can have 9 times, but then I can't have 9 times 5 in 1, wherefore I try 8 times, which makes 32, and there remains 4, which makes the next 41. Then 8 times 5 is 40 from 41, and there remains 1, but then 8 times 6 being 48, from 17 can't be; ſo I muſt take 7 times, which try'd as the other, I find will do, therefore I ſet it in the *Quotient*; then *Multiply* and *Subtract* as before, and ſeeing the Figures in the *Quotient* anſwer the number of Points made at the beginning, the Sum is done.

Diviſion by Figures with Cyphers may be contracted as before, by *Dividing* by an Unite with Cyphers, *viz*. Cut off as many Figures from the right Hand of the *Dividend* as there are Cyphers toward the right hand in the *Diviſor*, and then *Divide* the remaining part of the *Dividend* by the Figures of the *Diviſor*, as before: Obſerving that the Figures ſo cut off from the *Dividend*, with the Surplus of the Operation; is a Remainder.

Example.

412|00) 83576|21

202 1176

352

Here 35221 is the *Remainder*, and muſt be taken in when you *Multiply* the *Diviſor* 41200 by the *Quotient* 202, in order to prove it.

This is done, when you *Multiply* the Unites, take in the Unites of the *Remainder*; when you *Multiply* by Tens, take in the Tens of the *Remainder*, *&c.* Or elſe having perform'd your *Multiplication*, add the *Remainder* to it.

Suppoſe 57689 *l.* 17 *s.* 6 $\frac{1}{2}$ *d.* was to be *Divided* equally between 37 Perſons, How much muſt each Perſon have? *Anſwer*, 1559 *l.* 3 *s.* 8 $\frac{1}{2}$ *d.* $\frac{16}{37}$.

Example.

l. *ſ.* *d.*

37) 57689 17 6½

.... 206

Pounds 1559 218

339

. 6 Pounds remaining

20

37) 137

Shillings 3 26 Shillings remaining

12

37) 318

Pence 8

22 Pence remaining.

4

37) 90

Farthings 2 16 Parts of a Farthing.

In this *Example*, *Firſt*, *Divide* the Pounds by the number of Perſons, and hereby you will find every one is to have 1559 Pounds.

Multiply the remaining 6 Pounds by 20 (becauſe 20 Shillings make a Pound) and take in the 17 Shillings in the Sum. This you ſee makes 137 Shillings, which *Divided* by 37 the *Quotient*, will be 3, and 26 Shillings remain.

Multiply thoſe 26 Shillings by 12 (becauſe 12 Pence make a Shilling) and take in the 6 Pence in the propos'd Sum: This will make 318 Pence, which if you *Divide* by 37, the *Quotient* will be 8, and 22 Pence remain over and above.

Multiply thoſe 22 Pence by 4 (becauſe 4 Farthings make a Penny) and take in the 2 Farthings in the Sum; this you ſee will make 90 Farthings, which alſo *Divide* by 37, the *Quotient* will be 2, and 16 Farthings remain over and above. By putting all the *Quotes* together, it is plain that every Perſon muſt have 1559 *l.* 3 *s.* 8$\frac{1}{2}$ *d.* and $\frac{16}{37}$th Parts of a Farthing.

To *Prove* theſe kind of Sums, you muſt *Multiply* where you *Divided*, and *Divide* where you *Multiplied*; and if it make the Firſt propos'd Sum, the Operation is right, as in this *Example*.

Multiply 37 by 2, and take in the 16 that remain'd, and it makes 90. *Divide* the 90 by 4, and it gives 22, and the 2 Farthings over in the Sum.

Multiply the 37 by 8, and take in the 22, it makes the 318. *Divide* the 318 by 12, it gives 26, and 6 Pence over, as in the Sum.

Multiply the 37 again by 3, and take in the 29, it will make 137, which Divided by 20, will give the 6 that remain'd of the Pounds, and the 17 Shillings over in the Sum,

Multiply 37 again by 1559, and take in the 6, and it will make 57689. the number of Pounds Firſt Propos'd; which *Proves* all to be right done,

Note, *You may* Divide or Multiply *Pounds, Shillings and Pence, by any Number not exceeding* 12, *in one Line without* Reduction, *as in the following* Examples.

	Dividend.						
	l.	*s.*	*d.*		*l.*	*s.*	*d.*
Diviſor 5)	756	3	$2\frac{1}{4}$	6)	570	11	$8\frac{1}{2}$
Quotient	151	4	$7\frac{1}{2}\frac{3}{5}$		95	1	$11\frac{1}{4}\frac{4}{6}$
Proof	756	3	$2\frac{1}{4}$		570	11	$8\frac{1}{2}$

In the *Firſt Example*, *I* ſay how many times 5 in 7, once 5 from 7 and there remains 2; which join'd to the next Figure being 5, makes 25. then 5 in 25, 5 times; how many times 5 in 6, once and there remains 1 *l.* or 20 *s.* which carried to the 3 *s.* makes 23 *s.* 5 in 23, 4 times, and there remains 3 *s.* or 36 *d.* and 2 *d.* makes 38 *d.* 5 in 38, 7 times and there reſts 3 *d.* or 12 Farthings, and 1 Farthing are 13 Farthings; 5 in 13 twice, and there remains 3, which is $\frac{3}{5}$ of a Farthing, or 3 Farthings among 5 Perſons.

To *Prove* this, *I Multiply* the *Quotient* 151 *l.* 4 *s.* $7\frac{1}{2}$ *d.* $\frac{3}{5}$ by 5 the *Diviſor*, and the

Product will be 756 *l.* 3 *s.* 2 $\frac{1}{4}$ *d.* the *Dividend* given.

Firſt, *I* ſay, 5 times 2 Farthings are 10 Farthings, and the 3 that remain'd are 13 Farthings, which being 3 Pence farthing, *I* ſet down 1 Farthing, and carry 3 Pence to the Pence; and ſay, 5 times 7 is 35 and 3 carried are 38 *d.* or 3 s. 2 *d.* *I* ſet down the 2, and carry the 3 *s.* to the Shillings, ſaying 5 times 4 are 20, and 3 are 23 *s.* or 1 *l.* 3 *s.* *I* ſet down 3 *s.* and carry 1 *l.* to the Pounds, ſaying 5 times 1 is 5, and 1 carried is 6. then 5 times 5 is 25, 5 and carry 2, 5 times 1 is 5, and 2 is 7, which compleats the *Proof*.

If the Learner will make himſelf Maſter of theſe Rules, *he will have no more new ones to Learn. What follows being only the Method of Uſing, or Applying the ſaid* Rules *to Practice.*

The following **Algebraical Signs** *or* **Characters** *will be found very beneficial: By which the ſeveral Operations of* **Arithmetic** *may be very ſignificantly and more conciſely expreſs'd, than in Words at length; and therefore I recommend the Uſe of them.*

igns	*Names.*	*Significations.*
+	More	The Sign of **Addition**; as 5 + 7, ſignifies 5 more 7, or that 7 is to be added to 5. In like manner when ſeveral Numbers are Connected by this Sign; as 4+6+12, it ſignifies that they are to be added together.
−	Leſs	The Sign of **Subtraction**; as 8 − 5 denotes leſs 5, or 5 ſubſtracted from 8.
×	Into	The Sign of **Multiplication** Thus 9×4 ſignifies 9 into 4, or multiply'd into or by 4.

÷	By	The Sign of **Diviſion**; as 10÷5 is 10 by 5, or 10 divided by 5. But this is expreſs'd more generally by placing the Number to be divided over that by which you divide, in manner of a Fraction. Thus $\frac{10}{5}$, or thus 5) 10, both which ſignifie the ſame, *viz.* 10 divided by 5.
=	Equal to	The Sign of **Equality**; as *6*=*6*, that is, *6* is equal to *6*; or *6*+*7*+*5*=18, which is *6* more, *7* more *5* is equal to 18.
∷	So is	The Sign of **Proportion**, which is always plac'd in the middle of four proportionable Numbers; Thus, 4 . 8 ∷ *6*. 12. which is to be read thus; As 4 is to 8, ſo is *6* to 12.

CHAP.

CHAP. VI.

REDUCTION

IS the **converting Numbers of one Species or Denomination into another**, and is perform'd by **Multiplication** when greater Names are to be reduc'd into ſmaller: and by **Diviſion** when ſmall (Names) are to be rais'd to greater. If the former is to be done, conſider how many Units are of the next **inferiour Denomination**, make one of the **Denomination** propos'd, and thereby multiply. If the latter, conſider how many of the **Denomination propos'd** will make one of the next **ſuperior Denominations**, and thereby **divide**. But if the Numbers to be reduc'd are of **divers Denominations**, and it is requir'd to bring them into the **loweſt**, the Higheſt muſt be brought into the next Leſs, taking in odd Numbers of that Denomination, if any be. **That** into the next Lower, as before, and ſo gradually 'till you come to the loweſt.

Here obſerve,

That	4 Farthings	make	a Peny.
	4 Pence		a Groat.
	3 Groats, or 12 Pence		a Shilling.
	5 Shillings		a Crown.
	4 Crowns, or 20 *s.*		a Pound.

The Pound is alſo ſometimes divided into two Angels, of each 10 *s.* and three Nobles, each 6 *s.* 8 *d.* a Mark is 13 *s.* 4 *d.* or two Nobles: But there are not now Current Coins of this value.

In *France* they reckon by Crowns, Livers, Souz, and Deniers, *viz.*

12 Deniers	make	one Souz.
20 Souz		one Liver.
3 Livers		one Crown.

In *Spain*,

34 Marvedies	make	1 Real Plata.
375 *ditto*, or 11 Real (plata and 1 more		a Duccat.
8 Ryals		a Piece of Eight.

In *Portugal*.

1000 Rees make 1 Mill-Ree.

In *Holland* Accompts are kept in Guilders, Stivers, and Pennings, *viz.*

16 Pennings	make	a Stiver.
20 Stivers		a Guilder.
6 Guilders		a Pound Flemiſh:

But all theſe Foreign Coins have ſometimes a higher or lower Value, according to the Courſe of Exchange, or Price agreed on between Merchants who draw Bills to thoſe Places.

Queſt. 1. In 5657 Pounds Sterling, how many (Farthings ?
× 20 The Shillings = a Pound.

113140 Shillings
× 12 The Pence = a Shilling.

1357680 Pence
× 4 The Farthings. = a Peny.

Anſw. 5430720 Farthings.

The following Queſtion is the Reverſe of this, and will therefore ſerve for a Proof.

Queſt. 2. In 5430720 Farthings; how many Pounds Sterling ?

Becauſe 4 Farthings = a Peny 4) 5430720 Farth.
Becauſe 12 *d.* = a Shilling 12) 1357680 Pence
Becauſe 20 *s.* = a Pound 2,0) 11314,0 Shil.
Anſw. 5657 ... Pounds

Queſt. 3. In 527 *l.* 15 *s* 7*d* $\frac{3}{4}$ how many Farthings

× 20 Taking in the 15 *s.*

1055 Shillings

× 12 Taking in the 7 *d.*

126667 Pence.

× 4 Taking in the $\frac{3}{4}$ *d.*

Anſw. 506671 Farthings.

Queſt. 4. In 506671 Farthings, how many Pounds Shillings, Pence, and Farthings?

$$\begin{array}{r|l} & 506671 \\ 4 & 126667.\ 3\ \text{Farthings} \\ 12 & 1055|5\ \ 7\ \text{Pence} \\ 2|0 & \end{array}$$

Anſw. --- 527|15 7$\frac{3}{4}$

Queſt. 5. In 576 *l.* 16 *s.* 9*d.* how many Crowns (of 5 *s.* each?

× 20 Taking in the 16 *s.*

11536 Shillings.

× 12 Taking in the 9 *d.*

60 *d.* are a Crown } 138441 Pence.

Anſw. 2307 $\frac{21}{60}$, *viz.* 2307 Crowns, and 21 (Pence over.

Queſt. 6. In 675 Marks of 13 *s.* 4 *d.* how many Pounds?

× 160   × 12

12) 108000   160 pence.

2.0) . 900.0

Anſw. 450 Pounds.

Firſt Reduce the 13 *s.* 4 *d.* into Pence, then Multiply the number of Marks thereby, and Divide them by 12, to bring them into Shillings; and laſtly by 20, to bring thoſe Shillings into Pounds.

Queſt. 7. In 500 Piſtoles of 17 *s.* 6 *d.* how many Guineas of 21 *s.* 6 *d.* each.

17 *s.* 6 *d.*
× 12

210 Pence in one Piſtole
× 500

21*s.* 6*d.*
12

258

258*d.* in a Guinea

406) 105000 Pence in all the Piſtoles
...
1800

252 Pence remaining, wanting but 6 to make a Piſtole

Anſwer 406 Guineas and $\frac{252}{258}$

Queſt. 8. In 5471 Livers, at 54 pence Sterling *per French* Crown, how many pounds Sterling?

3) 54

18

Divide the pence in a *French* Crown by 3, becauſe ſo many Livers are in a *French* Crown, and you have the value of one Liver.

Then 5471
× 18

12) 98478 pence in all the Livers.

(2,0) 820.6. $\frac{6}{12}$ Shillings.

Anſw. 410. 6. 6 Sterling.

Queſt. 9. How many Livers ſhall be given in Exchange for 200 Pounds Sterling, the Exchange being at 52 *d.* Sterling *per French* Crown?

```
                 200
          ×       20
          ----------
                4000
          ×       12
          ----------
        52)    48000
        -----     ..
Fr. Crowns 923   120
      ×      3   160
      --------   ---
                   4
                 ---
Anſw.  2769 Livers
       ----
```

Queſt. 10. In 875 Livers, 4 Souz, at 56 *d.* Sterling *per French* Crown, how many Pounds Sterling?

875 Livers, 4 Souz.
× 37 Halfpence in a Liver.

6125
2625

2) 32375 Halfpence in all the Livers.

12) 16187 $\frac{1}{2}$ pence

2.0) 134.8. $\frac{11}{12}$ Shillings.

67 . 8. 11 $\frac{1}{2}$ pounds, *&c.*
+ 3 $\frac{3}{4}$ for the 4 Souz

Anſw. 67 . 9 . 3 $\frac{1}{4}$ Sterling.

3|56 (
18 $\frac{1}{2}$
2
37 half-pence

Queſt. 11. In 7542 Guilders, how many Pounds Sterling, the Exchange being at 34 *s.* 6 *d.* *Flemiſh*, *per* Pound Sterling?

34 *s.* 6 *d.* Becauſe 6 Guilders make a pound *Flemiſh* } 6.) Guilders
× 12 7542

414 pence in a *Flem.* Pound. 1257 *l. Flem*
× 20

25140 Shill.
× 12

Pence in a *Flem.* Pound 414) 301680 pence

Pounds Sterling 728. 1188
3600

288 Rem.
20

414) 5760

Shillings Sterling 13 1620

Anſw. 728 *l.* 13 *s.* 10 *d.* $\frac{3}{4}$ Sterling. 378
× 12

414) 4536

Pence Sterling 10 396
× 4

414) 1584

Farthings 3 342

Queſt. 12. How many Guilders ſhall I receive in exchange for 450 *l.* 10 *s.* Sterling, allowing 36 *s.* 8 *d. Flemiſh per* Pound Sterling?

36 *s.* 8 *d.*

× 12

440 pence in one Pound *Flemiſh*

× 450 $\frac{1}{2}$ = 450 *l.* 10 *s.*

22000

1760

+ 220 the half of 440

12) 198220 pence *Flemiſh*

20) 16518 $\frac{4}{12}$

825..18.4

× 6

Anſw. 4955 10.0.

Guild. Stivers

Having reduc'd the *Flemiſh* Pound into Pence, by multiplying by 12, which gives 440, multiply the the ſame by 450$\frac{1}{2}$, and thereby you will have the *Flemiſh* Pence in ſo many Pounds Sterling. Divide by 12, and then by 20, and you will have the *Flemiſh* Pounds. Multiply that by 6, and it gives the Anſwer in Guilders; What ſtands in the Shillings are Stivers.

This may be perform'd ſhorter, Thus:

Let the Pounds Sterling ſtand for ſo many Pounds: Take the half thereof for the 10 *s.* and the $\frac{1}{3}$ thereof for the *6 s.* 8 *d.* and add them all together, the Total is pounds *Flemiſh*. Multiply by *6*, as before, becauſe *6* Guilders make 1 pound *Flemiſh*.

Stand for the 1	450 .	10 . 0
for 10 *s.* take $\frac{1}{2}$.	225 .	5 . 0
for *6 s.* 8 *d.* take $\frac{1}{3}$	150 .	3 . 4
	825 .	18 . 4
	×	6
Anſw.	4955 .	10 . 0
	Guild.	*Stivers*

Queſt. 13. In 987 *Guilders* of 6 *s.* 10 *d.* $\frac{5}{9}$, how many *Mill-Rees* of 3 *s.* 6 *d* $\frac{7}{18}$.

```
            6 s. 10 d 5/9   ×  12 taking in the 6
     ×  12 taking in the 10——
        ——                    42  Pence
         82  Pence          ×  16 taking in the 7
      ×   9  taking in the 5   ——
         ——                   679  16th part
        743  9th pts of a Peny.     of a Pen
      × 987  Numb. of Guild.        in a Mill
      —————                         Ree,
       5201
      5944
     6687
     ———————
    9)733341 9th pts of a Peny in all the Guild.
    ————————
      81482 Pence in all the Guilders
    ×    16
   ———————————
 679)1303712   16th pts of a Peny in the Guild.
16th pts. •••••
of a Pe-  6247
ny in a   1361
Mil Ree  ——————
          ••32
         ——————
Anſwer 1920 Mil-Rees.
```

Queſt. 14. In 979 *Duccats* of *Rome* of 3 *s.* 8*d.* $\frac{15}{22}$
× 983 each how many Pounds Ster.

```
                 2937           3 s. 8 d. 15/22
                7832        ×    12
               8811              ----
               ----              44 d
         22)962357           ×   22
  ------                         ----
12)  43743    .....:              93
  ------      82                 89
2|0) 364|5 3/12  163             ----
  ------          95            983  22d parts of a
      182. 5. 3.   77                     Peny in one
                  ----
                   11                     Duccat.
                  ----
```

Anſwer 182 *l.* 5 *s.* 3 *d.* $\frac{11}{22} = \frac{1}{2}$ *d.*

Reduction

Reduction of Troy-Weight.

FOR the the Tables of this and Averdupoiz Weight, I refer you to *Chap*. II.

Queſt. 1. In 327 *ll*. how many Grains?
× 12 Ounces in a *ll*.

3924 Ounces
× 20 peny wts. in an Ounce,

78480 Peny Weights.
× 24 Grains in a Peny Weight.

313920
156960

Anſwer 1883520 Grains

Queſt. 2. In 1883520 Grains how many Pounds?
24) 1813520 . . . . .

2|0)7848|0 *dwts*. 203
115
12) 392402 192

327 *ll*. . . 00

Anſwer 327·Pounds.

Queſt. 3. In 16 Ingots each 11 *ll.* 12 *dwts.* 19 *gr.* how many Grains?

ll. *dwts.* *gr.*
11 12 19
× 12

132 Ounces
× 20 taking in the 12

2652 Peny Weights
× 24 taking in the 19

10617
5305

63667 Grains
× 16 Number of Ingots

Anſwer 1018672 Grains.

Queſt. 4. How many Silver Tankards, each 34 *oz.* 18 *dwts.* 20 *gr.* may be made out of 17 Ingots, each 8 *ll.* 10 *oz.* 21 *gr.*

8 *ll.* 10 *oz.* 21 *gr.*
× 12 taking in the 10

106 ounces
× 20

2120 peny weights
× 24 taking in the 21

8481
4242

50901 grains
× 17 number of Ingots

16772)865317

51 26717

9945

34 *oz.* 18 *dwts.* 20 *gr.*
× 20 taking in the 18

698 peny weights
× 24 taking in the 20

2792
1398

16772 grains in one Tankard

Anſwer, 51 Silver Tankards and $\frac{9945}{16772}$, which is more than half another.

Redu-

Reduction of Avoirdupoize-Weight.

Queſt. 1. In 2460 *ll.* how many Hundred weight?

1 C. is 112 *ll.*) 2460

21 220

108

Anſwer, 21 *C.* $\frac{108}{112}$ = 21 C. 3 *qrs.* 24 *ll.*

Queſt. 2. In 21 C. 3 *qrs.* 24 *ll.* how many *ll.*

× 4 taking in the 3

87 quarters

× 7

609

× 4 taking in the 24

becauſe 4×7=28, taking in the 24 when you multiply by the laſt 4.

Anſwer, 2460 Pounds.

Queſt. 3. In 27*C.* 1*qr.* 17*ll.* how many Ounces,

× 4 taking in the 1

109 quarters

× 7 multiply by 7 and 4 becauſe 7×4=28.

763

× 4 taking in the 17

3069

× 16

Anſwer, 49104 Ounces.

Queſt. 4. In 54 Cheſts, each qt. 15*C.* 1*qr.* 19*ll.* how many Pounds and Boxes of 1 C. 1 *qr.*

15 C. 1 *qr.* 19 *ll.*
× 4 taking in the 1
61 quarters
× 4
244
× 7 taking in the 19
1727 pounds in a Cheſt
× 54 number of the Cheſts
6908
8635
14|0)9325|8 pounds in all the Cheſts
...
666 92
85
18

1 C. 1 *qr.*
4 taking in the 1
5 quarters
× 7
35
× 4
140 Pounds.

Anſwer, 666 $\frac{18}{140}$ Boxes. 93258 Pounds.

Care

Tare and Tret.

TARE is a certain allowance for the Hogſhead, Cheſt or Bagg wherein any Commodity is brought over and preſerv'd.

Tret is an allowance of 4 Pounds in every 104 *l.* in garbled Goods, that is ſuch Goods wherein is Waſte, as Grocery Wares, Drugs, *&c.* and is allow'd to none but Citizens of *London.*

Net ſignifies the clean or clear Weight of any ſuch Commodity diſtinct from the aboveſaid Allowances for the Cask or Waſte.

If the Tare *be ſo much* **per Hogſhead, Bag, or Cheſt.** *Multiply the Number of the Hogſheads, &c. by the allowance of the* Tare; *Subſtract that from the Pounds Groſs, and the Remainder will be the Pounds Net.*

Queſt. 1. In 25 *Hhds.* each containing *Groſs* 9 C. 3 *qrs.* 21 *ll.* *Tare* 21 *ll.* ½ *per Hbd.* how many pounds *Net*?

25 Numb. of *Hhds.*
× 21 ½ Allowance
25
50
12 ½
537 ½ Tare

9 C. 3 *qrs.* 21 *ll.*
× 4
39 quarters
× 28
313
80
1113 *ll.* groſs in a Hogſhead
× 25
5565
2226
27825 *ll.* groſs in all the Hhds.
537 ½ Tare

Anſwer 27287 ½ *ll.* Nett

If the *Tare* be an allowance *per* Hundred Weight and an even part of 112, divide the Pounds by ſuch part of 112, and then ſubtract the Quote therefrom, and the Remainder will be the Pounds Net.

Queſt. 2. In 24 Butts of *Currants*, each cont. Groſs 18 C. 1 *qr.* 11 *ll.* Tare 16 *ll. per* 112, how many pounds *Net?*

18 C. 1 *qr.* 11 *ll.*
× 4

73 quarters
× 28

585
147

16) 112 2055 pounds in one Butt
7 ... × 24 Number of Butts

8220
4110

7)49320 pounds Groſs in all the Butts

$7045\frac{5}{7}$ pounds Tare

Anſwer. $42274\frac{2}{7}$ pounds Net.

If the **Tare** is not **an even part of** 112 *ll*, multiply the Pounds Groſs by the allowance of the *Tare*, divide that by 112 and you have the *Tare*, which ſubtract from the Groſs as before.

Queſt. 3. In 12 Cheſts, each 5 *C.* 3 *qrs.* 7 *ll.* Tare 19 *ll.* *per* 112 how many pounds Net?

```
             7812 ll. Groſs
          ×    19   Tare
          ------------
     112 ) 148428
             ....
   ------
Tare 1325    364
              282
               588
          ------------
               28 = ¼

          5 C. 3 qrs. 7 ll.
      ×   4
     ------
         23   quarters
      ×  28
     ------
        191
        46
     ------
        651   pounds in one Cheſt
      ×  12   number of Cheſts
     ------
       7812   pounds Groſs
     — 1325 ¼  Tare
     ------
Anſwer, 6486 ¾ ll. Net.
```

When there is an Allowance of ***Tret***, after the ***Tare*** is ſubtracted you call thoſe Pounds, Pounds ſubtle, and after the *Tret* is ſubtracted, the Remainder are the Pounds Net.

Queſt. 4. In 6 Hhds each containing Groſs, *viz.* Tare 7 *ll. per* 112 *ll.* Tret 4 *ll. per* 104 *ll.* how many Pounds Net?

C.	*qrs.*	*ll*
9	1	24
7	3	23
8	1	27
9	0	26
10	2	25
11	1	26
57	1	11

57 . 1 . 11 Total of all the Hogſheads.

7)112 16|6423 pounds Groſs

16 Tare 401 023

7

4)104 26|6022 pounds Subtle

26 Tret 231 82

42

16

57 *C.* 1 *qr.* 11 *ll.*

× 4

229 quarters

× 28

1833

459

6423 pounds Groſs

— 401 Tare

6022 pounds Subtle

— 231 Tret

Anſwer, 5791 pounds Net

Queſt. 5. In 37 Hogſheads, each Groſs 8 *C.* $\frac{3}{7}$ Tare 8 *ll.* *per* 112 *ll.* Tret 4 *ll.* *per* 104 *ll.* how many pounds Net.

112

× 3

7)336

48 *ll.* To be taken in for the $\frac{3}{7}$ when you multiply by 28.

8)112 8 C. $\frac{3}{7}$

× 4

14 to divide by ——

32

14)34928 × 28

2494.69 264

Tare 132 68

68

944 *ll.* Groſs in one Hogſh.

12 × 37 Number of Hogſheads

4)104 6608

2832

26

34928 *ll.* Groſs in all the Hhds

26)32434 — 2494 Tare

1247.64 32434 pounds Subtle

Tret 123 — 1247 Tret

194

Anſw. 31187 pounds Net.

12

Reduction

Reduction of Cloth-Meaſure.

4	Nails	make	1	Quarter
4	Quarters		1	Yard
5	Quarters		1	Ell Engliſh
6	Quarters		1	French Auln
3	Quarters		1	Ell Flemiſh

Queſt. 1. In 248 yards how many Quarters, Nails and Ells Engl.

× 4

992 Quarters

× 4

Becauſe 20 Nails are 1 Ell *Engl.* 2|0)396|8 Nails

198 $\frac{8}{20}$

Anſwer. 198 $\frac{8}{20}$ Ells Engl.

Queſt. 2. In 198 $\frac{8}{20}$ Ells Engl. how many yds?

× 20 taking in the 8

4)3968 Nails

4)992 Quarters

Anſwer, 248 Yards.

Queſt. 3. In 7094 Quarters, how many Nails, and Pieces of 32 Ells *Engl.*

× 4

64'0)2837|6 Nails

44 277

216

× 5

160 Quarters

× 4

640 Nails

Anſwer, 28376 Nails, 44 Pieces and $\frac{216}{640}$.

Queſt. 4. In 54 Packs, each containing $48\frac{1}{2}$ Pieces, each Piece containing $38\frac{1}{2}$ yds, how many Quarters and French Aulns?

$38\frac{1}{2}$

× 4

154 Quarters in one Piece

× $48\frac{1}{2}$ Pieces in one pack

1232

616

+ 77 for $\frac{1}{2}$ piece

7469 Quarters in one Pack

× 54 Number of Packs

29876

37345

6 Quart. are a Fr. Auln. } 6)403326 Quarters in all the Packs

67221 French Aulns

Anſwer, 403326 Quarters, and 67221 Fr Aulns

Reduction of Long-Meaſure.

3 Barley-Corns	make	1 Inch
12 Inches		1 Foot
3 Feet		1 Yard
5 $\frac{1}{2}$ Yard		1 Rod, Pole or Perch
40 Poles		1 Furlong
8 Furlongs		1 Mile or 1760 yards
3 Miles		1 League
20 Leagues		1 Degree
360 Degrees		The Comp. of the Globe

Queſt. 1. In 569586 Yards how many Miles?

```
176|0)56958|6
        ...
323    415
        638
       ----
       1106
```

Anſwer, 323 Miles $\frac{1106}{1760}$.

Queſt. 2. In 323 Miles, 1106 Yds. how many Yds?

```
 ×  1760 taking in the 1106
   -----
    19386
   2262
   324
   -----
```

Anſwer, 569586 Yards.

Queſt. 3. If from *London* to *York* be 150 Miles, how many Barley Corns (laid end to end) will reach from one Place to the other?

1760
× 150

264000 Yards.
× 3

792000 Feet
× 12

9504000 Inches
× 3

Anſw. 28512000 Barly Corns

Queſt. 4. If the Circumference of the Globe be 360 Degrees, and every Degree 60 Miles, how many Barley-Corns (laid end to end) will reach round the ſaid Globe?

```
                 360
        ×         60
        ------------
               21600 Miles
        ×       1760
        ------------
             1296000
            151200
            21600
        ------------
            38016000 Yards
   ×               3
   -----------------
           114048000 Feet
   ×              12
   -----------------
          1368576000   Inches
   ×               3
   -----------------
Anſwer,   4105728000 Barley Corns
   -----------------
```

The Learner by this time, I doubt not, will be ſo far Maſter of **Reduction**, as to need no more Inſtances of any other Meaſures, and therefore I omit them, there being no Difficulty in any of them,

CHAP.

CHAP. VII.

Of Vulgar Fractions.

A **Fraction is a Part or Parts of an Integer**, (ſuppos'd to be the *Remainder* after ſome *Diviſion*) and is expreſs'd by two Numbers, whereof one is plac'd over the other with a Line drawn between them, thus $\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$, *&c* of which the Uppermoſt is called the **Numerator**, and the Lowermoſt the **Denominator**.

The *Denominator* ſhews into how many Parts an Unit is divided, and the *Numerator* diſcovers how many of thoſe Parts are taken, as $\frac{3}{4}$ ſhews a Line, a Pound, a Shilling, an Ell, or any thing elſe, to be divided into 4 parts, and 3 of thoſe 4 are the Value of the *Fraction*; and it may be read either *Three Fourths of an Unit*, or the *Fourth part of three Units*, or 3 divided by 4; for the $\frac{3}{4}$ ſuppoſe of a Shilling $=$ 9 *d.* $= \frac{1}{4}$ of 3 Shillings.

When the *Numerator* of a *Fraction* is equal to the *Denominator*, the *Fraction* is equal to Unity, thus, $\frac{5}{5} = 1$:

When the *Numerator* is leſs than the *Denominator*, the *Fraction* is leſs than *Unity*; as in $\frac{2}{3}$, 3 is not contain'd in 2 once; and ſuch *Fractions* are called **Proper** or **Simple Fractions**.

When the *Numerator* is greater than the *Denominator*, the *Fraction* is more than *Unity*, and is term'd an **Improper Fraction**, as $\frac{5}{3} = 1 + \frac{2}{3}$, which, when ſo expreſs'd, is call'd a **Mixt Number**, as being part an *Integer*, and part a *Fraction*.

When an *Integer* is ſuppos'd to be divided into any Number of Parts, and each of thoſe Parts ſubdivided into other Parts, ſuch Fractions are called **Compounded Fractions**, or **Fractions of Fractions.** Theſe are always connected together by the Particle (of) as $\frac{3}{4}$ of $\frac{5}{8}$ of $\frac{7}{9}$. And whereas the former ſort are ſometimes joined together by the Signs + or —, or the Particles, *And*, *Or*, *&c.* As $\frac{1}{2} + \frac{3}{4} - \frac{1}{3}$, or thus $\frac{1}{2}$ and $\frac{2}{3}$ and $\frac{3}{4}$, *&c.*

To change or reduce Fractions into *Fractions* of other *Denominations* of the ſame Value.

The following Propoſitions will be found neceſſary.

PROP. I.

If a Number multiply two other Numbers, the Products will be in the ſame Proportion to each other, as the Numbers multiply'd were. That is to ſay, if both the *Numerator* and *Denominator* of a *Fraction* be multiplyed by the ſame Number, the Products will be of the ſame Value.

Example, Let 2 and 4 be multiply'd by 3, I ſay that as 2. 4 : : 6.12 or $\frac{2}{4} = \frac{6}{12} = \frac{2\times3}{4\times3}$

PROP. II.

If a Number divides 2 other Numbers, the Quotes will be in the ſame Proportion to each other as the Numbers divided were. That is, if both the *Numerator* and *Denominator* of a *Fraction* be divided by the ſame Number, the *Quotes* will be of the ſame Value.

Example, Let 3 divide 6 and 12. I ſay as, 6.12 : : 2.4 or, $\frac{6}{12} = \frac{2}{4}$.

Hence ariſes the Method of Reducing two or more Fractions of different Denominations into others that ſhall have a Common Denominator, and yet be of the ſame Value. And this may be perform'd theſe three ways.

Firſt, If the leaſt *Denominator* can be multiply'd ſo as to become equal to the other; then increaſe the *Numerator* and *Denominator* of the leaſt *Fraction* in the ſame Ratio by *Multiplication.*

Example, If $\frac{2}{3}$ and $\frac{5}{6}$ were propos'd, you ſee that 3 the leaſt *Denominator* may be rais'd to 6 by multiplying it by 2, but unleſs you alſo multiply the *Numerator* by 2, you alter the Value of the *Fraction*, therefore you have $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$, ſo the propoſed *Fractions* become $\frac{5}{6}$ and $\frac{4}{6}$, having the ſame *Denominator*, and retaining the ſame Value, as $\frac{2}{3}$ and $\frac{5}{6}$.

Thus, $\frac{4}{15} + \frac{3}{5} = \frac{4}{15} + \frac{9}{15} = \frac{3\times3}{3\times5}$

Secondly, If you diſcover at firſt ſight (elſe trouble not your ſelf about it) that both *Denominators* have ſome common *Multiplyer*, divide them both by it, and multiply the Quotes alternately into each others *Numerator*, and the Quotes and that common Quantity into one another for a new *Denominator.*

Example, $\frac{1}{4} + \frac{5}{18} = \frac{9}{36} + \frac{10}{36}$

Demonſtration. $\frac{1}{4} + \frac{5}{18} = \frac{}{2\times2} + \frac{5}{2\times9} = \frac{1\times9}{2\times9\times2} + \frac{2\times5}{2\times9\times2}$

Thirdly, If they can't be reduced by the two preceeding ways, then multiply each *Numerator* into all the *Denominators* except its own, for new *Numerators*, and all the *Denominators* together for a common *Denominator*.

Example, If $\frac{3}{7}+\frac{6}{9}+\frac{11}{12}+\frac{7}{8}$ were propos'd,

They are equal to

$$\frac{3\times\cancel{9}\times\cancel{12}\times8}{7\times\cancel{9}\times\cancel{12}\times8}+\frac{6\times\cancel{7}\times\cancel{12}\times8}{\cancel{7}\times9\times\cancel{12}\times8}+\frac{11\times\cancel{7}\times\cancel{9}\times8}{\cancel{7}\times\cancel{9}\times12\times8}$$

$$+\frac{7\times\cancel{7}\quad\cancel{9}\times\cancel{12}}{\cancel{7}\times\cancel{9}\times\cancel{12}\times8}$$

As is very viſible The Figures above the Line that are multiply'd into the *Numerators*, being all deſtroy'd by the ſame under the Line which divides them, therefore I have drawn a *Line* thro' the ſame.

If perform'd at length, $\frac{3}{7}+\frac{6}{9}+\frac{11}{12}+\frac{7}{8}$ will equal $\frac{1592}{6048}+\frac{4032}{6048}+\frac{5544}{6048}+\frac{5292}{6048}$

To **reduce mix'd** or **whole Numbers** to **Improper Fractions.**

Multiply the *Integer* by the *Denominator* of the *Fraction*, taking in the *Numerator*, and the *Product* is a new *Numerator*, under which ſubſcribe the *Denominator*.

Example, $5+\frac{3}{8}=\frac{43}{8}$ becauſe $=5\times8+3$.

So $12+\frac{3}{7}=\frac{87}{7}$ becauſe $=12\times7+3$.

Whole Numbers are reduc'd to *Fractions* by placing Unity under the Line for a *Denominator*, thus, $5=\frac{5}{1}$.

To

To Reduce Improper Fractions to Integers or mix'd Numbers.

Divide the *Numerator* of the *Fraction* by its *Denominator*, and what remains ſet down in manner of a *Fraction*, with the *Denominator* underneath.

Thus $\frac{43}{8} = 5 + \frac{3}{8}$ and $\frac{87}{7} = 12 + \frac{3}{7}$.

To reduce compounded Fractions into Simple ones.

Multiply all the *Numerators* together for a new *Numerator*, and all the *Denominators* together for a new *Denominator*,

Thus, $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4} = \frac{1 \times 2 \times 3}{2 \times 3 \times 4} = \frac{6}{24}$

To depreſs or reduce a Fraction into the loweſt Term.

This is perform'd by dividing both *Numerator* and *Denominator* by **any Number** which you obſerve is a common Meaſure of both.

Thus $\frac{100}{360}$ may be reduced firſt to $\frac{10}{36}$ by cutting off a Cypher from each, and $\frac{10}{36}$ may be reduced to $\frac{5}{18}$ by dividing both parts by 2.

Thus $\frac{24}{96} = \frac{6}{24} = \frac{3}{12} = \frac{1}{4}$

To

To find the Greateſt Common Meaſure.

Divide the **Greater Number** by the **Leſſer**, and that *Diviſor* by the *Remainder*, if any be, and ſo continually till there be no *Remainder* left. Then will that laſt *Diviſor* be the greateſt Common Meaſure.

Example Suppoſe I would know the greateſt Common Meaſure between 72 and 208, *viz.* of $\frac{72}{208}$.

$$\begin{array}{lll} & 72)208 & \\ 2 & & 64)72 \\ & & 1 \end{array}$$

8 the Common Meaſure.

Having found 8 to be the greateſt Common Meaſure, I divide $\frac{72}{208}$ by 8, and I have $\frac{9}{26}$ the loweſt Term that *Fraction* can be reduced to.

Beſides the Rules before mention'd, take theſe following.

If the *Numerator* and *Denominator* are even, halve them continually.

Example $\frac{64}{136}\Big|\frac{32}{68}\Big|\frac{16}{34}\Big|\frac{8}{17}$

If both the Terms begin with 5, or one of them with a Cypher, divide them by 5 continually.

Example $\frac{125}{625}\Big|\frac{25}{125}\Big|\frac{5}{25}\Big|\frac{1}{5}$

If both Terms begin with Cyphers, cut off equal Cyphers in both, and then (if the *Fraction* will be yet in leſſer Terms) work by the foregoing Rules.

Example $\frac{4}{5}\Big|\frac{00}{00} = \frac{4}{5}$ $\frac{7}{25}\Big|\frac{000}{000} = \frac{7}{25}$

To find the Value of any Fraction.

Multiply the *Numerator* of the *Fraction* by the next lower Denomination of the *Integer*, and divide that by the *Denominator*. If any thing remains, multiply again by the next lower *Denomination*, and divide again as before, and ſo till you bring it into the loweſt Terms.

Example Suppoſe the $\frac{6}{9}$ of a **Pound Sterling** was propoſ'd.

$$\frac{6\times20}{9} = 13 \text{ Shillings} + \frac{3}{9}$$

Then $\frac{3\times12}{9} = 4$ Pence. So that

You ſee $\frac{6}{9} = 13$ *s.* 4 *d.*

In Page 45 is an Inſtance hereof, where the *Remainder* is $\frac{6}{27}$ and 17 *s.* 6 *d.* $\frac{1}{2}$ are alſo taken in, which being largely ſet down, I refer thereunto.

To

To find whether a **Fraction** is **Bigger** or **Leſs** than another.

Multiply the *Numerators* into each others *Denominator*, and if the *Products* are equal, thoſe 2 *Fractions* are ſo, if not, you'll ſee which is the largeſt.

Example, $\frac{3}{4} = \frac{9}{12}$ becauſe $4 \times 9 = 3 \times 12 = 36$

Thus, $\frac{5}{7}$ is larger than $\frac{7}{16}$

becauſe $5 \times 16 = 80$
whereas $7 \times 7 = 49$

Addition of Fractions.

The foregoing Operations were to prepare *Fractions* of divers *Denominations* to be added or ſubtracted: For till they are reduced into *Fractions* of one *Denomination*, they are uncapable of either. And when that is done, **Then add all the Numerators together for a new Numerator, and place the common Denominator underneath.**

The reaſon hereof will appear from hence.

C D
A |—|—|—|—|—|—|—|—| B

Let the Line AB, be divided into 8 (or more) equal parts AC $= \frac{3}{8}$ of it, and CD $= \frac{2}{8}$ of it.
Now the Sum of AC + CD = AD $= \frac{5}{8}$
That is $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$ which is only an Addition of the *Numerators*.

Example of Simple Fractions.

If $\frac{3}{4}$ and $\frac{5}{7}$ were to be added,

Being reduced to a common *Denominator*, they are equal to $\frac{21}{28}$ and $\frac{20}{28} = \frac{41}{28}$ or $1 + \frac{13}{28}$

Example of Compounded Fractions.

If $\frac{5}{6}$ and $\frac{2}{3}$ of $\frac{3}{8}$ were to be added,

Firſt, $\frac{2}{2}$ of $\frac{3}{8} = \frac{6}{24}$ then $\frac{5}{6} + \frac{6}{24} = \frac{120}{144} + \frac{36}{144}$ which being added are equal to $\frac{156}{144} = 1 + \frac{12}{144}$

Example of Mix'd Fractions.

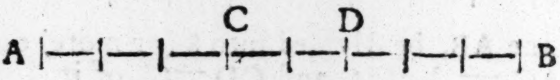
Add $2\frac{3}{4}$ and $5\frac{6}{7}$ together

Reduc'd to improper *Fractions*, they $= \frac{11}{4} + \frac{41}{7}$

Reduc'd to a Common *Denominator*, they $= \frac{77}{28} + \frac{164}{28} = \frac{241}{28}$

Subtraction of Fractions.

Having reduc'd your *Fractions* to a common *Denominator* from the greater *Numerator*, ſubtract the Leſſer, the *Remainder* is a new *Numerator*, under which ſubſcribe the common *Denominator*.



Conſider the Line aforeſaid.

If from AD, you take CD, there remains AC, that is $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$ which is only a *Subtraction* of the *Numerators*.

Example

Example of Simple Fractions.

Suppoſe $\frac{5}{8}$ were to be taken from $\frac{6}{7}$

Being reduced they would $=\frac{35}{56}$ from $\frac{48}{56}=\frac{13}{56}$

Example of Compounded Fractions.

If $\frac{2}{3}$ of $\frac{3}{7}$ were to be ſubtracted from $\frac{11}{12}$

Firſt, $\frac{2}{3}$ of $\frac{3}{7}=\frac{6}{21}$. Then $\frac{6}{21}$ and $\frac{11}{12}=\frac{72}{252}$ and $\frac{231}{252}$

Then $\frac{231}{252}-\frac{72}{252}=\frac{159}{252}$

Example of Mix'd Numbers

From $7\frac{1}{3}$ take $3\frac{1}{4}$

Firſt, $7\frac{1}{3}=\frac{22}{3}$ and $3\frac{1}{4}=\frac{13}{4}$

Then $\frac{22}{3}-\frac{13}{4}=\frac{88}{12}-\frac{39}{12}=\frac{49}{12}=4\frac{1}{12}$

Multiplication

Multiplication of Vulgar Fractions.

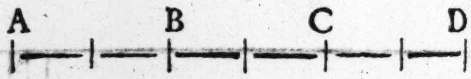
TO prepare the Terms for *Multiplication* or *Diviſion*, *Compounded Fractions* muſt be reduc'd into *Simple* ones.

Mixt Numbers brought into improper *Fractions*, and whole Numbers expreſs'd like *Fractions*, if abreviated into the loweſt Terms, the eaſier will the Work be.

Def. Multiplication is a taking the *Multiplicand* ſo often as there are *Units* in the *Multiplyer*. Therefore to multiply 6 by 4, the *Product* will be 24 $= 6+6+6+6$. So $4\times1=4$. $4\times\frac{1}{2}=2$.

First, Suppoſe I was to multiply a Fraction by an Integer.

Let a Line AD be divided into 6 or more equal parts.



AB is $\frac{2}{6}$ of the whole, ſo is BC and CD. Now if I would double $\frac{2}{6}$ I muſt multiply 2 into the *Numerator*, which makes $\frac{4}{6}$, which is all one as taking AB twice, which is equal to AC $=\frac{4}{6}$.

Corollary 1. **To multiply an Integer by a Fraction**, or a *Fraction* by an *Integer*, which is all one, is to multiply it into the *Numerator* only.

Thus, $5\times\frac{3}{8}=\frac{15}{8}$ $4\times\frac{7}{12}=\frac{28}{12}$

Secondly, Suppoſe I would multiply Fractions together whoſe Numerators are Unity or 1. as $\frac{1}{2}\times\frac{1}{4}$.

From the Definition, it appears I can't take the *Multiplicand* ($\frac{1}{4}$) ſo much as once, the *Multiplyer* being not ſo great as Unity, but only $\frac{1}{2}$ of Unity, therefore to multiply $\frac{1}{2}$ by $\frac{1}{4}$, is all one as to take the $\frac{1}{2}$ of $\frac{1}{4}$ which is evidently $\frac{1}{3}$.

Corollary 2. **In Fractions whoſe Numerators are Unity, the Denominators muſt be multiply'd together.**

Corollary 3. **To multiply by** $\frac{1}{2}$. $\frac{1}{3}$: $\frac{1}{4}$, &c. **is the ſame as to divide by** 2 3 . 4 . &c.

Corollary 4. **The Particle** (*of*) **which is a ſign of Diviſion in Integers is the ſign of Multiplication in Fractions.**

Thirdly, Suppoſe any *Fractions* whatſoever were to be multiplyed as $\frac{2}{3}\times\frac{5}{7}$.

$$\left.\begin{array}{l}\frac{2}{3} = 2\times\frac{1}{3}\\ \text{and } \frac{5}{7} = 5\times\frac{1}{7}\end{array}\right\}\text{by } \textit{Corol.}\ 1.$$

Therefore $\frac{2}{3}\times\frac{5}{7}$ is the ſame as multiplying continually $2\times\frac{1}{3}\times5\times\frac{1}{7} = 2\times5\times\frac{1}{3}\times\frac{1}{7}$ for it's no matter in what order Quantities are multiply'd, the laſt Product being ſtill the ſame. Then is $\frac{2}{3}\times\frac{5}{7} = \frac{10}{21}$ the Product ſought where you ſee the *Numerators* are multiplyed together for a *Numerator* and the *Denominators* together for a *Denominator*.

Corol.

Corollary 5. Univerſally therefore multiply all the Numerators together for a new Numerator, and all the Denominators for a new Denominators.

Hence alſo it appears that ***Multiplication*** of ***Fractions*** is a double Operation, the ***Numerator*** multiplyes, and the ***Denominator*** divides.

Diviſion of Vulgar Fractions.

To divide, is to give the Ratio of 2 Quantities, as to divide 64 by 4, is to expreſs the Ratio of 64 to 4, thus, $\frac{64}{4}$ or $\frac{32}{2}$ or $\frac{16}{1}$.

Hence whenever the ***Diviſor*** becomes ***Unity***, the ***Dividend*** is the ***Quote*** in ***Vulgar Diviſion***. But here we have 3 ***Quotes*** $\frac{64}{4}$ or $\frac{32}{2}$ or $\frac{16}{1}$ all of the ſame Value

If $\frac{21}{1}$ divides $\frac{27}{1}$ ($\frac{27}{21}$ is the Quote $= \frac{9}{7} = 1\frac{2}{7}$

Divide it actually you will find it the ſame.

$$21)\ 27\ (1 + \tfrac{6}{21} = 1 + \tfrac{2}{7};$$

Hence to divide a ***Fraction*** by a ***Fraction***, is to give the Ratio of one to the other, that is indeed to give the Ratio of 2 Ratio's.

Example, $\frac{2}{3})\ \frac{4}{7}\ ($ Quote I am to find the Ratio that $\frac{4}{7}$ hath to $\frac{2}{3}$.

Rule.

Let the Dividend ſtand as it doth, and multiply the Diviſor inverſely into it.

Thus $\frac{2}{3}\Big)\frac{4}{7}\Big(\frac{3\times4}{2\times7} \text{——} \frac{12}{14}$ the *Quote* or *Ratio* ſought.

Now I am to prove that $\frac{2}{3} : \frac{4}{7} :: 12 . 14$.

Reduce $\frac{2}{3}$ and $\frac{4}{7}$ to a Common *Denominator*, and you will have $\frac{12}{21}$ and $\frac{14}{21}$ equivalent to the propos'd *Fractions*. Therefore $\frac{12}{21} . \frac{14}{21} :: 12 . 14$ becauſe they are both equally divided by 21, therefore inſtead of uſing the Ratio $\frac{12}{21}$ and $\frac{14}{21}$ I may uſe that of 12 and 14.

Chap. VIII.

Of Decimal Fractions.

THEY are ſo call'd from the Word **Decem** **Ten**, becauſe a *Unit* is ſuppos'd to be divided into 10 equal parts, each of which will therefore be $\frac{1}{10}$th part, and every one of thoſe tenth parts to be again divided into 10 equal parts, then every firſt *Diviſion* will be $\frac{1}{10}$ or $\frac{10}{100}$ and every ſecond D*iviſion* in reſpect of the whole, will be $\frac{1}{100}$, ſo that if 4 Tenths and a half of ſuch D*iviſion* were to be expreſs'd, it would be thus, $\frac{45}{100}$.

And thus any thing whatſoever, as a Pound, a Shilling, a Day, an Hour, *&c.* may be divided into 10, 100, 1000, *&c.* equal parts, and into the greater Numbers of Parts the *Unit* is divided, the nearer to the true Value is the D*ecimal*.

an Integer	is ſuppos'd to conſiſt of	10 Primes
a Prime		10 Seconds
a Second		10 Thirds
a Third		10 Fourths, *&c.* ad Infinit.

A *Decimal Fraction* is known from whole Numbers by a Point prefix'd, and always has a *Unit* with Cyphers for a D*enominator*, which may therefore be left out and yet known, being always

ways an Unit with ſo many Cyphers as there are Figures in the *Numerator*, thus,

$.2 = \frac{2}{10}$ $.54 = \frac{54}{100}$ $.086 = \frac{086}{1000}$

So in mixt Numbers $67.2 = 67\frac{2}{10}$ $375.54 = 375\frac{54}{100}$, *&c.*

1 **Cyphers** on the Right Hand of a *Decimal Fraction* alter not the Value thereof.

for .5 .50 .500 .5000

are all of the ſame Value and equal to $\frac{5}{10}$ or $\frac{1}{2}$.

2 **Cyphers** on the Left Hand of a *Decimal Fraction* decreaſe that Number in a Ten-fold Proportion, thus, a *Cypher* prefix'd to .15 makes it Value $\frac{015}{1000}$, whereas it was but $\frac{15}{100}$.

To reduce **Decimal Fractions** to a **Common Denominator.**

This is perform'd by making all the *Numerators* to conſiſt of the ſame number of Places, by adding the Cyphers ſo |3. |45. |057,|0089 all which conſiſting of 4 places, the common *Denominator* is a Unit with 4 Cyphers.

To reduce a **Decimal Fraction** into a **Vulgar.**

This is done by placing the *Denominator* underneath, and then reducing it into the Loweſt Terms.

Thus, $.5 = \frac{5}{10} = \frac{1}{2}$.

To reduce a **Vulgar Fraction** to a **Decimal.**

To the *Numerator* of the Given *Fraction* add what number of Cyphers you pleaſe, and divide by the *Denominator*.

Thus $\frac{3}{4}$ths of a *l.* is equal to $|\underline{75}$ $\qquad 4)^{3}\frac{000}{75}$,

$\frac{1}{48}$ of a *l.* $=$ 02183 $\qquad$ 48)$\underline{10000}$(2183, *&c.*

$$\begin{array}{r} 400 \\ \hline 160 \end{array}$$

To

To turn **Money** into **Decimals**.

If it be Shillings add what number of Cyphers you pleaſe, and divide by 20 the number of Shillings in a Pound,

Thus, 17 *s.* is equal to $\frac{17}{20}$ of a *l.* that is to |85

2|0| 1700|0

85.

If it be Shillings and Pence, reduce it into Pence, add Cyphers, and divide by 240 the number of Pence in a Pound.

Thus, 2 *s.* 6 *d.* is $\frac{30}{240}$ of a Pound is equal to |125

If it be Shillings, Pence and Farthings, reduce it into Farthings, add Cyphers, and divide by 960 the number of Farthings in a Pound.

Thus 2 *s.* 6 *d.* $\frac{1}{2} = \frac{122}{960}$ of a *l.* or |127 in *Decimals*

To value any Number of **Decimals**,

Multiply the *Decimals* by the next inferior Denomination of the *Integer* that is by 20 if of a Pound, and cut off from the *Product* ſo many Figures by a Point as there were *Decimals* in the *Multiplicand*. Thoſe on the Left Hand are Shillings, and if any thing remains, multiply again by the next lower *Denomination*, that is by 12, and cut off as before, and ſo proceed to the leaſt *Denomination* of the *Integer*.

Example.

.964 of a Pound
20

19.280
12

3.360
4

Anſw. 19*s.* 3*d.* $\frac{1}{4}$ 1.440

To value **Decimals** of a **Pound** by **Inſpection.**

The Value of every firſt Figure in *Decimals* is in Money ſo many times two Shillings as it contains *Units*, the Value of every 2*d.* and 3*d.* together is ſo many Farthings.

Thus .889 is in Money 17 *s*, 9 $\frac{1}{4}$

For 8 ═ 16 *s.*

and 89 ═ 1 . 9$\frac{1}{4}$

17 *s.* 9$\frac{1}{4}$ *d.*

To prove this, I work the ſame Queſtion by the former Rule, thus, what's the Value in Money of

,889
20

17,780
12

9,360
4

1,440

Anſwer 17 *s.* 9½ *d.*

Here obſerve, that 3 Figures in *Decimals* will expreſs any Sum of Shillings, pence, and Farthings: and if you have not 3 Places, add a Cypher.

Note alſo, that 25 Farthings in *Decimals* make Six Pence, therefore you muſt reject one in every 25 Farthings in valuing *Decimals*, and in expreſſing Money in *Decimals*, you muſt take one for every 25 or 6 Pence.

To expreſs 6½ in *Decimals*, it will make .027

The Reaſon of which, is becauſe 1000 Farthings in *Decimals* are ſuppos'd to make the Pound, whereas in Money there are but 960, ſo that there is an Exceſs of 40 Farthings. Therefore 500 exceeds the Truth by 20, 250 by 10, and 125 by 5, the ⅕ thereof by 1 which muſt be rejected.

Addition of Decimals.

Here and in *Subtraction* you muſt take great Care in placing your Figures, for every Figure muſt be plac'd directly underneath that above of of the ſame Value, which will be eaſily done by having a due Regard to the Points of Separation or Comma's, which ſhould always ſtand directly one under another; this done, add them up as whole Numbers.

Examples.

	,3270	75,864	3,2796
	,6417	5,320	,7648
	,3279	,876	7,8010
	,7187	,327	6,4195
Sums	2,0153	82,387	18,2649

Sub-

Subtraction of Decimals.

Examples.

From	527,5	From	7,50	From	,71986
Take	97,6	Take	4,82	Take	,18649
Rem.	429,9		2,68		,53337

In Addition and Subtraction of *Decimals*, cut off with a Point or Comma, as many places of Decimal Parts as are in any of the given Numbers, and when the *Decimals* to be added or ſubtracted, have not the ſame number of Places; you may annex Cyphers.

Multiplication of Decimals.

The Multiplication of **Decimals** is likewiſe the ſame with that of **whole Numbers**; onely you are to conſider, that if the *Numbers* to be multiply'd, are either all *Decimals*, or *whole Numbers* and *Decimals* join'd, you muſt multiply them together as if *whole Numbers*. And in the Product, ſeparate ſo many places of *Decimal* Parts as there are in both the *Multiplyer* and *Multiplicand*.

Examples.

multiply	37,29	multiply	1753	multiply	723,2
by	62,7	by	1,2	by	5,53
	26103		3506		21696
	7458		1753		36160
	22374	Product	,21036		36160
Prod.	2338,083			Prod.	3999,296

Note, when there are not ſo many Decimal places in the Product as in both the **Multiplicand** and **Multiplyer**, add or place a Cypher, or Cyphers on the Left Hand 'till ſupply'd.

Example.

multiply	,1753
by	,12
Product	,021036

Diviſion of Decimals.

Rule.

In this Rule alſo the Operation is the ſame with that in **Whole Numbers**. But after the *Diviſion* is ended, ſee how many **Decimal places** there are in the *Dividend*, and how many in the *Diviſor*; for in the *Quotient* there muſt be ſo many cut off towards the Right Hand as the *Dividend* has more than the *Diviſor*.

Example I.

Divide) 200,0005215
by 75,85) 48300
27905
2,63679 51502
55921
68265
0

Example II.

Divide) 123,50000
by 27)
4,57407

Example III.

```
Divide )75,3895
by ,058) 173
         578
1299,8   569
          475
          ----
           11
```

Example IV.

```
Divide )100025
by ,75) 250
        352
1347    525
        ----
          0
```

Example V.

```
Divide )1,70000
by 53)
-------
,03207
```

Example VI.

```
Divide ),05763
by 15)
-------
,00384
```

In the firſt Example, where a *whole Number* and a *Fraction* is divided by a *whole Number* and a *Fra-*

ction, the *Quotient* is a *whole Number* and a *Fraction*, there being five *Decimals* more in the *Dividend* than in the *Diviſor*, ſo 5 are cut off in the *Quotient*.

In the Second Example, where a *whole Number* and a *Fraction* is divided by a *whole Number*, there being 5 *Decimals* in the *Dividend*, and none in the *Diviſor*, 5 are cut off in the *Quotient*.

In the Third Example, where a *whole Number* and a *Fraction* is divided by a *Fraction*, the *Quotient* is a *whole Number* and a *Fraction*, 4 *Decimals* in the *Dividend* and 3 in the *Diviſor*, there one is cut off in the *Quotient*.

In the Fourth Example, where a whole *Number* is divided by a *Fraction*, the *Quotient* is *whole Numbers*, being no *Decimals* in the *Dividend*, there muſt be none cut off in the *Quotient*.

In Example the Fifth, where a *whole Number* and a *Fraction* is divided by a *whole Number*, and the *Quotient* has not *Fractions* enough to cut off five *Decimals*, prefix a Cypher to the *Quotient* to ſupply that Defect.

If you have not places enough in your *Quotient* to cut off as many *Decimals* therein as your *Dividend* exceeds your *Diviſor* (then prefix Cyphers on the Left Hand, till you have, as in the laſt Example.

CHAP.

Chap. IX.

Of Proportion, *or the* Rule of Three.

This Rule teaches by **Three given Numbers** *to find a* **Fourth** *in ſuch Proportion to the* **Third** *as the* **Second** *bears to the* **Firſt**, *and is either* **Direct** *or* **Reverſe.**

WHEN the Second Number is in ſuch Proportion to the Firſt as the Fourth to the Third, ſuch Numbers are ſaid to be directly proportional, as 2 *:* 4 : : 8 *:* 16.

Whenever four Numbers are in direct Proportion, the Product of the two Extreams is equal to the Product of the Means,

That is, $2\times16=4\times8$

Numbers being equally multiplyed and divided, the Products and Quotes ariſing, are ſtill in the ſame Proportion.

If $2\times16=4\times8$ then $\frac{2\times16}{2}=\frac{4\times8}{2}$

As has been made appear in *Vulgar Fractions.*

And from hence ariſes the Rule or Method to find a fourth Number in Proportion to three Given Numbers, *viz.* **Multiply the third Term by the ſecond, and divide that Product by the firſt.**

In ſtating theſe Queſtions, let your firſt and third Terms be of one *Denomination*, or, if otherwiſe, reduce them into one.

Your middle Term muſt alſo be reduc'd into the Name mention'd, and your Anſwer will be of that kind.

Example I.

If 10 Yards of Cloth coſt 8 *l* what coſt 5 Yds

yds. *l.* *yds.* *l.*
10 : 8 : : 5 : 4 the Anſwer
8
1,0)4,0
4

Anſwer 4 *l*:

Multiply 5 the third Term by 8 the ſecond, produces 40, which divide by 10 the firſt, the Anſwer is 4 *l*.

Example

Example II.

If 2 *lb*, of Soap coſt 5 *d.* $\frac{1}{2}$ what coſts 59 Pounds?

lb. : *d.* : : *lb.*
2 : 5$\frac{1}{2}$: : 59
4 22
22 Farthings. 118
118
2)1298 Farthings Anſwer
4) 649
12) 162 . $\frac{1}{4}$ *d.*
13 . . 6 $\frac{1}{4}$

s. *d.*
anſwer 13 : 6$\frac{1}{4}$

When you have reduc'd your middle Term into the loweſt Name mention'd, which is Farthings, you multiply 59 *lb.* by your ſaid middle Term, and divide by your firſt, and the Quote is 649 Farthings, becauſe your middle Term is reduc'd to Farthings, which anſwers the Queſtion.

Example

Example III.

If 1 Yard of *Serge* coſt 3 *s.* 6*d.* what will 74 Yards coſt ?

yd. *s.* *d.* *yds.*
1 : 3 . 6 : : 74
12 42
42 148
296
12)3108
2|0)25|9
l. 12 . 19

Anſwer 12 *l.* 19 *s.*

If your firſt Number be 1, the Product of your ſecond and third is the Anſwer of the Queſtion, becauſe 1 neither multiplies nor divides.

Example

Example IV.

If I give *6 s.* 3 *d.* for a Hundred of Oranges, what do I pay a piece?

Oranges *s.* *d.* *Orange*
ſtated thus. 100 : 6 . 3 :: 1 : 3 Farthings
12
75
4
1.00|3.00| Anſwer $\frac{3}{4}$ *d.*
3 0

Example

Example V.

If 2 Yards of Cloth coſt 19 *s.* 10 *d.* what will 27 Ells coſt?

yds.		*s.* *d.*		*Ells*
2	:	19 . 10	::	27
4		12		5
8		238 pence		135
				238

1080
405
270

8)32130

12)4016$\frac{2}{8}$

2|0)33|4 . 8

l. 16 . 14 . 8$\frac{2}{8}$ = $\frac{1}{4}$

Anſwer 16 *l.* 14 *s.* 8 *d.* $\frac{1}{4}$

When you have multiply'd your Yards by 4, and your Ells by 5, your firſt and third Numbers will be of one *Denomination.*

Example

Example VI.

If 16 Thouſand of Deal-Boards coſt 533 *l.* 6 *s.* 8 *d.* what is that apiece?

Deals *l.* *s.* *d.* *Deal* *d.*
16000 : 533 .. 6 .. 8 :: 1 : 8 the Anſw.
20

10666
12

16|000)128|000

8. 0 Anſwer 8 *d.*

Here your firſt and Third Numbers are of one *Denomination*, when you have brought your ſecond into the loweſt Name requir'd, *viz.* Pence, divide it by 16000 your firſt, and the *Quotient* is 8 *d.* the Price of one Deal.

Example

Example VII.

It a pair of Stockings coſt 3 *s.* 4 *d.* how many dozen Pair ſhall I have for *66 l.* 13 *s.* . . 4*d.*

s. *d.* *pair* *l.* *s.* *d.*
ſtated thus 3 . 4 ; 1 : : *66* . 13 . 4 : 33$\frac{1}{3}$Doz.
12 20
40 1333
12
4.0)*1600*.0
12)400
Anſwer 33 Doz. 4 Pair. 33 4 Pair $=\frac{1}{3}$

Example VIII.

A Tradeſman went aſide when he found himſelf indebted *769 l.* 11 *s.* and offer'd his Creditors 12 *s. 6 d. per l.* Query what pays the Compoſition?

s.		*s.* *d.*		*l.* *s.*		*l.* *s.* *d.*
20	:	12 . 6	: :	769 . 11	:	480 . 19 . $4\frac{1}{2}$
		12		20		
		150		153.91		
				× 150		

2,0)230865,0

12)115432$\frac{10}{20}$

2|0) 961|19 : 4

Anſw. *l.* 480 . 19 . $4\frac{10}{20} = \frac{1}{2}$

When you have multiply'd your ſecond and third Numbers together, divide by 20 your firſt (which is here done, cutting off the firſt Figure towards the Right Hand, and taking half the reſt of the Figures) your Anſwer is in Pence, which when rais'd by dividing by 12 and 20, are pounds, *&c.*

Example

Example IX.

Two Ships ſet Sail from one Port at one time, one ſails 56 Leagues *per* Day *South*, the other 72 Leagues *per* Day *North*. In how many Days will they be 834 Leagues aſunder?

$$56+72=128$$

Leagues		*Day*		*Leagues*		*Days*
128	:	1	::	834	:	$6\frac{66}{128}$

128)834

6

66

Anſwer $6\frac{66}{128}$ Days

Example

Example X.

A Gentleman having 800 *l. per Ann.* would know what he ſpends a Day to lay up 75 *l.* at the Year's end?

L.
From 800
deduct 75

725

Days		*l.*		*Day*		*l.*		*s.*		*d.*
365	:	725	: :	1	.	1	. .	19	. .	$8\frac{1}{2}$

20

14500
12

365)174000

12)476 2800
2450

2|0)3|9 . 8

260

l. $1 \cdot 19.8\frac{260}{365} = \frac{1}{2}$

Anſwer 1 *l.* 19 *s.* 8 *d.* $\frac{1}{2}$

Example

Example XI.

A Pipe conveys 37 Gallons of Water every Hour into a Ciſtern capable of receiving 745 Gallons, and at the ſame time runs out thro' a Hole in the Bottom, 22 Gallons *per* Hour, in how many Hours will the Ciſtern be full?

$37 - 22 = 15$

Gall.		*Hour*		*Gall.*		*Hours*		*Minutes*
15	:	1	::	745	:	49	.	40

$15)745$

$49\frac{10}{15}$ 145

10

Anſwer 49 Hours $\frac{10}{15} = 40$ MInutes.

Example XII.

If 3 Yards of Scarlet Cloth be worth 5 Yards of Black, and 4 Yards of Black be worth 3 *l.* 13 *s.* 7 *d.* what is the price of one Yard of Scarlet?

yds. l. s. d. yds. l. s. d.

first 4 : 3 .. 13 .. 7 :: 5 : 4 .. 11 .. 11$\frac{3}{4}$

20

73

12

883

5

4)4415

12)1103 $\frac{3}{4}$

2|0) 9|1 . 11

l. 4 . 11 . 11 $\frac{3}{4}$

yds. *l.* *s.* *d.* *yd.* *l.* *s.* *d.*

3 : 4 . 11 . 11 $\frac{3}{4}$: : 1 : 1 . 10 . 7 $\frac{3}{4}$

20

91

12

1103

4

3)4415

4)1471 $\frac{2}{3}$

12)367 $\frac{3}{4}$

2|0) 3|0 . 7

l. 1 . 10 . 7 $\frac{3}{4}$ Anſwer 1 *l.* 10 *s.* 7*d.* $\frac{3}{4}$

Example XIII.

If 10¾ Yards of Kerſey coſt 35*s.* 6*d.* what coſt 327 Pieces, each Piece containing 32½ Yards?

	s. *d.*		
10¾	35 . . 6	327	32½
4	12	130	4
43 *qrs.*	426 *d.*	42510	130 *qrs.*

Qrs. : *d.* :: *Qrs.*

43 : 426 :: 42510

426

255060

85020

170040

43)18109260

12)421145 90

49

2|0)3509|5 . 5 .62

196

*l.*1754.15.5½ 240

25 = ½

Anſwer 1754*l.* . 15*s.* . 5*d.* ½

Example XIV.

If 1 Yard of Kerſey coſt 8 *s.* for how much muſt it be ſold to gain 5 *l. per Cent* ?

l. *l.* *s.* *d.*

100 : 5 :: 8 : 4 $\frac{4}{5}$

20 20

2000 100

12

1200

8

2|000)9|600

4 $\frac{1600}{2000} = \frac{4}{5}$

To 4 *d.* $\frac{4}{5}$ add 8 *s.* the Price of the Kerſey, and the Sum anſwers your Demand ?

Otherwiſe thus.

l. *s.* *l.* *s.* *d.*

100 . 8 :: 105 : 8 : 4 $\frac{4}{5}$

12 96

96 630

945

1|00)100|80 Anſw. 8 *s.* 4 *d.* $\frac{4}{5}$

12)100 $\frac{80}{100}$

8 . 4 $\frac{80}{100} = \frac{4}{5}$

Example XV.

If an Ell of *Holland* be ſold for 5 *s*. and I gain after the Rate of 8 *per Cent*, I would know what is gain'd *per Cent*, when an Ell thereof is ſold at 5 *s*. 2 *d*.

```
 s.      l.        s.   d.     l.    s.
 5   :  108  : :   5  .  2  : 111 . 12
 12      20        12
 --    ----        --
 60    2160        62
         62
       ----
       4320
      12960
      -----
6|0)13392|0
    -------
  2|0)223|2
      -----                Anſwer 11 l. . 12 s.
  l. 111 . 12 .
```

Example

Example XVI.

If 1 Pound of Tobacco coſt 18 *d.* and is ſold for 21 *d.* what is gain'd *per Cent* ?

From 21
deduct 18

3*d.*

d. *d.* *l.* *l.* *s.* *d.*
18 : 3 :: 100 : 15 . 13 . 4.
20

2000
12

24000
3

18)72000

12)4000 0000

2|0)33|3 . 4 0

l. 16.13.4

Anſw. 16 *l.* 13*s.* 4*d.*

Example XVII.

If 4 Yards of Linen Cloth coſt 16 *s.* 6 *d.* and 1 Yard thereof be ſold for 2 *s.* 7 *d.* do I gain or loſe, and how much *per Cent?*

```
            s.   d.            s.   d.
            2  . 7            16  . 6
           ×     4          — 10  . 4
           --------           --------
           10 . . 4            6  . 2
           --------           --------

 s.      d.     s.    d.        l.     l.     s.    d.
 16  . . 6  :   6  . . 2  : :  100  :  37 . . 7 . . 5 1/2
 12             12              20
 ----           --            -----
 198 .          74             2000
                                 12
                              -----
                              24000
                                 74
                              -----
                              96000
                             168000
                            -------
Anſw. 37l. 7s. 5d. 1/2 . 198)1776000
                             ....
           12)8969         1920
           -------         1380
          2|0) 74|7.5       1920
           --------       -------
           l37.7.5 1/2  .  138 = 1/2
```

Example XVIII.

Admit 99 Pipes of Wine that contain 11076 Gallons, I would know how much 57 Pipes will contain, and what it will amount to at 42 *l. per* Tun, the Tun being 236 Gallons?

Pipes		*Gall.*		*Pipes*
99	:	11076	: :	57

```
              11076
                 57
              -----
              77532
             55380
             ------
          99)631332
   ----       ....
   6377      373
              763
               702
              ----
                 9
              ----
```

Gall.		*l.*		*Gall.*
236	;	42	: :	$6377\frac{9}{99}$
99		20		99
2124		840		57402
2124		12		57393
23364		10080		631332
	: :		:	10080
				50506560

Answ. 1134 *l.* 8*s.* 1*d.* ¼   63133200

23364)6363826560

12)272377   169102

55546

2|0) 2269|8.1   88185

180936

l. 1134.8.1 ¼   173880

10332 = ¼

Example

Example XIX.

If 1 Yard of Sattin coſt 1*l.* 9*s.* 11 *d.* $\frac{3}{4}$, what coſt 74 Pieces, 40 whereof contains 10 Ells each, and the reſt 15 Yards each ?

Yds.	*l. s. d.*	*Pieces*	*Ells*	*Pieces*	*Yds.*
1 :	1 . 9 . 11$\frac{3}{4}$ ::	40 *qt* .	10 .	34 *qt* .	15
4	20		5		4
4	29		50		60
	12		40		34
	359		2000		210
	4		2040		180
	1439		4940		2040
	4040				
	57560				
	57560				

4)5813560

4)1453390

12)363347 $\frac{1}{2}$

2|0)3027|8.11

l. 1513 . 18 . 11 $\frac{1}{2}$

Anſw. 1513 *l.* 18 *s.* 11 *d.* $\frac{1}{2}$.

Example XX.

A B and C can do a piece of Work in manner following, *viz.* A can do it alone in 54 Days, B in 60 Days, and all in 15 Days, I demand in what time C can do it ?

Days		Work		Days
60	:	1	::	$\frac{54}{60}$

$\frac{54}{60}$

Add . 1

$1\frac{54}{60}$

Work		Days		Work		Days
$1\frac{54}{60}$	:	54	::	1	:	$28\frac{48}{114}$
60		60		60		
114	114)3240			60		
	28	960				
		48				

Anſwer 28 $\frac{48}{114}$ Days.

Example

Example XXI.

A Merchant bought 5760 C. of Copper, which coſt 5 *l.* 10 *s.* *per* C. the Charges upon the ſame amounts to 51 *l.* which he ventures to *Spain*, to receive from thence *Spaniſh Wine* at 10 *l.* 11 *s.* 5 *d.* *per* Hogſhead, the Hogſhead being 63 Gallons, I demand how many Hogſheads muſt he receive?

```
C.    l.     s.       C.
1  :  5 ..  10  : :  5760
      20              110
      ---            -----
      110           57600
                    5760
                   -------
                 2|0)63360|0
                   -------
                    31680
                 —     51
                   -------
                 l. 31629
```

10 *l.* 11 *s.* 5 *d.* : 1 *Hog* : : 31629 *l.*

20 63 20

211 63 *Gall.* 632580

12 12

2537 7590960

63

22772880

45545760

2537)478230480

63)188502 22453

21570

2992 625 12744

580 005980

132 906

6

Anſwer, 2992 *Hogs,* 6 $\frac{906}{2537}$ *Gall.*

Example XXII.

An Ox was bought for 15 *l.* which weighed beſides Skin and Legs 846 *ll.* the Skin and Legs were ſold for 34 *s.* 6 *d.* there was 8 *Stone* (or 64 *ll.*) of Tallow in him, which he ſold for 5 *d. per* Pound. How much doth one Stone of Beef ſtand him in? and how much muſt he ſell one Stone for, that he may gain 40 *s.* by the whole Ox?

```
     l.          l.    s.    d.         ll.
     64          15 .  0  .  0          846
      5        — 3  .  1  .  2         —64
   ————        ————————————————       ————
 12)320          11 . 18  . 10          782
   ————        ————————————————       ————
 2|0)2|6 . 8
    —————
    1 . 6 . 8
   +1 . 14 . 6
    —————
    3 . 1 . 2 } The Price of the Skin, Legs and
                  Tallow.
```

782 *ll.* : 11 *l.* 18 *s.* 10 *d.* :: 8 *ll.*
20

238
12

2866
8 — 40 *s.*
12

782)22928 — 480
2866

12)29 7288 — 3346 *d.*

2*s.* 5*d.* 150

782 *ll.* : 3346 *d.* :: 8 *ll.*
8

782)26768

12)34 3308

2*s.* 10*d.* 180

It ſtands him in 2 *s.* 5 *d.* *per Stone*, and he muſt ſell it for 2*s.* 10 *d.* *per Stone* to gain the aforeſaid 40 *s.*

Example XXIII.

A Draper ſent to *France* 100 *Packs* of Broad-Cloth, each *Pack* containing 30 *Pieces*, each *Piece* $34\frac{1}{2}$ *Yards*, at 11 *s.* 6 *d.* *per Yard*, with all Charges born, to receive $\frac{3}{4}$ in Wine at 25 *l.* *per Tun*, and $\frac{1}{4}$ in Capers at 30*s* *per* C. I demand how much Wine and how many Capers he muſt receive ?

$34\frac{1}{2}$ 4 *Qrs.* : 11 *s.* 6 *d.* : : 414000 *Qrs.*
4 12 138

138 138 3312000
30 1242000
414000

4140 4)57132000
100

414000 *Qrs.* 12)14283000

2|0)119025|0

L. 59512.10

25 *ll.* : 1 *Tun* : : 44634 *l.* 7 *s.* 6 *d.*
20 20

500 892687
12 12

6000 6|000)10712|250

$1785\frac{2250}{6000}$ = $94\frac{1}{2}$ Gall.

30 *s.*

```
30 s.  :   112 ll.   : :        14878 l. 2 s. 6
12                                    20
----                            ----------
360                               297562
                                      12
                                ----------
                                 3570750
                                     112
                                ----------
                                 7141500
                                3570750
                               3570750
                               -----------
                      36|0)39992400|0
               -----------  ........
          112)1110900          ..
      -------     ....        39
      9918      1029           39
                 210            324
                  980            000
                 ----           ----
                   84              0
```

Anſwer, 1785 *Tun* 94 ½ *Gallons* of Wine, an 9918 *C.* 84 *ll.* of Capers.

Example

Example XXIV.

I have received, upon my Factor's Accompt, from *France* 150 Pipes of Wine, for the Return of 120 Dozen Pair of Stockings at *9 s. 6 d.* a Pair, and *6760* Pair at 12 *s. 6 d.* a Pair, with all Charges born thither. I demand how much the Wine doth ſtand me in *per Tun*, and how much *per Gall.* when there was 70 *s. per Tun* Cuſtom, and 40 *s. per Tun* Exciſe, and 246 *l.* 10 *s. 6d.* for Freight ?

1 Pair : *9 s. 6 d.* :: 1440 Pair

12	114	120 Doz.
114	5760	12
	1440	1440 pair
	1440	
	12)164160	
	2|0)1368|0	
	L. 684	

1 Pair

```
1 Pair  :   12 s. 6 d.   : :  6760 Pair
            12
           ----
           150
           6760
           ----
           9000
          1050
          900
        -------
     12)1014000
        -------
      2|0)8450|0
        -------
        L. 4225
```

l.	s.	d.
684	00	0
4225	00	0
3	10	0
2	00	0
246	10	6
L. 5161	00	6

2)150

2)150 Pipes
Tun 75 Tun 75 : *l.* *s.* *d.* 5161.0.6 :: Tun 1
20
103220
12
75)1238646
12)16516 488
386
2|0)137|6.4 114
396
L. 68.16.4½ 46=½

252 Gallons : 68 *l.* 16 *s.* 4 *d.* ½ :: 1 Gall.
20
1376
12
16516
4
252)66066
4)262 1566
546
12)65½ 42
5 *s.* 5 *d.* ½

Anſwer, 68 *l.* 16 *s.* 4 *d.* ½ *per Tun*, and 5 *s.* 5 *d.* ½ *per Gallon.*

Example

Example XXV.

A Merchant carry'd Money from *London* to *Turkey*, and there gain'd by Trading 54 *l*. 10*s*. 10*d*. *per Ct*. and ſpent of his Gains 1528 *Dollars*, each 4*s*. 8 *d*. and yet had 1451 *l*. left of Clear Gains. How much Money did he depart from *London* with?

1 *Dollar* : 4 *s*. 8 *d*. : : 1528 *Dollars*
12 56
56 9168
7640
12)85568
2|0)713|0 . 8
356 . 10 . 8
+ 1451 . 0 . 0
L. 1807 . 10 . 8

54 *l*.

```
54 l. 10 s. 10 d.  :  100 l.  : :  1807 l. 10 s. 8 d.
   20                                   20
------                              --------
 1090                                36150
   12                                   12
------                              --------
13090                               433808
                                         100
                                    ---------------
                      1309|0)4338080|0
                                ....
                ----------------
     L.  3314 — 54/1309 = 3/4 d.   4110
                                   1838
                                    5290
                                   ------
                                      54
```

Anſwer 3314 *l.* 0 *s.* 3/4 *d.*

Example

Example XXVI.

A Grocer bought 2 Hogſheads of Sugar, the one weighed 9 *C.* 2 *Qrs.* at 4 *d.* $\frac{1}{2}$ *per ll.* the other 8 *C.* 1 *Qr.* 10 *ll.* at 4 *l.* 11 *s.* 6 *d. per C.* both which mingled together, I demand the Worth of an *C. wt?*

1 *ll.* : 4 *d.* $\frac{1}{2}$: : 9 *C.* 2 *Qrs.*

4   4

18   38

28

304

76

1064

18

8512

1064

4)19152

12)4788

2|0)39|9

19 . 19 . 0 firſt Hhd.

38 . 3 . 0$\frac{1}{2}$ ſecond Hhd.

58 . 2 . 0 $\frac{1}{2}$

1 *C.*

```
1 C.  :  4 l. 11 s. 6 d.  ::  8 C. 1 qr. 10 ll.
  4      20                    4
 ---    ----                  ---
  4      91                   33
 28      12                   28
 ---    ----                  ---
112    1098                  264
                              67
                             ---
                             934
                            1098
                            ----
                            7472
                           8406
                          9340
                          -------
                     112)1025532
                            ....
              ------
           12)9156        175
              -----        633
           2|0)76|3        732
              -----        ---
        L.  38 . 3 , 0½     60 = ½
```

C.	qrs.	ll.
9	2	~
8	1	10
17	3	10

17 *C.* 3 *qrs.* 10 *ll.* : 58 *l.* 2 *s.* 0½ *d.* : : 112 *ll.*

4　　　　20

71　　　　1162

28　　　　12

568　　　　13944

143　　　　4

1998　　　　55778

112

111556

55778

55778

1998)6247136

4)3126　2531

5333

12)781 . ½　13376

2|0)6|5 . 1　1388

L. 3 . 5 . 1½

Anſwer, 3 *l.* 5 *s.* 1 *d.* ½.

Rule of Three Reverſe.

THIS Rule is generally call'd **Reverſe**, when the firſt Number is to the third as the ſecond is to the fourth, and then the third Term being greater than the firſt, requires leſs, or being leſs than the firſt, requires more.

Whereas in the Direct Rule, the third Term being greater than the firſt, requires more, or being leſs than the firſt, requires leſs.

Example I.

If 16 Men can do a piece of Work in 6 Days, how many Days will 8 Men do it in?

Where it is plain, that the third Term requires more than the firſt, and is leſs.

Example II.

If 8 Men can do a piece of Work in 12 Days, how many Days can 16 Men do the ſame?

Here the third Term requires leſs time, and is greater.

Alſo in ſtating of theſe Queſtions, let your firſt and third Terms be of the ſame kind, and your ſecond and fourth.

	Men		*Days*		*Men*		*Days*
Example I.	16	:	6	::	8	:	12
Example II.	8	:	12	::	16	:	6

Which done, multiply your firſt and ſecond Terms together, and divide by your third, and the Quotient will be the Anſwer.

The reaſon of which is, if 8 Men require 12 Days, 'tis plain, 1 Man will require 8 times 12 Days=*96* Days. But if 1 Man can do it in *96* Days 'tis certain that 1*6* Men can do it in $\frac{1}{16}$ part of the time; therefore *96* divided by 1*6*, muſt needs be the Anſwer, *viz*. *6*.

Example III.

If a Board be 8 Inches broad, how many Inches of it in Length will make a Foot ſquare?

Inch broad		*Inch long*		*Inch broad*
12	:	12	::	8
12				
8)144				
18				

Anſwer 18 Inches

Example

Example IV.

If, when the Price of a Buſhel of Wheat is 7 *s.* 6 *d.* a Peny Loaf weigh 6 ounces, what muſt it weigh when the Price of a Buſhel of Wheat is 4 *s.* 6 *d.*

7 *s.* 6 *d* : 6 *ounces* : : 4 *s.* 6 *d.*
12   12

90 pence   54 pence
6

540   54)540

10   00

0   Anſwer, 10 *Ounces.*

Example V.

I deſire to know how many yards of Shalloon of 1 $\frac{3}{4}$ yd. broad, will line 5 $\frac{1}{2}$ yds of Drugget of 1 $\frac{1}{4}$ yd. broad?

yd. broad   yds. long   yd. broad
1 $\frac{1}{4}$: 5 $\frac{1}{2}$: : 1 $\frac{3}{4}$
4   4   4

5   22   7
22

110   7) 110

4)15   40

3 $\frac{3}{4}$ 5

Anſwer, 3 $\frac{3}{4}$ yds. and $\frac{5}{7}$ of $\frac{1}{4}$ yd.

Example VI.

If I lend a Perſon 150 *l.* for 12 months, how long ought he to lend me 60 *l.* to requite me?

150 *l.* : 12 *months* :: 60 *l.* : 2 *years* 6 *mo.*

```
 12
----
1800      6|0)180|0
          ---------
            12)30
            -----
             2 . 6
```

Anſwer, 2 years 6 months.

CHAP. X.

Rules of Practice.

THIS kind of Operation is call'd **Practice**, becauſe it is a more brief and ready way of finding *Reſolutions* to ſuch *Queſtions* in the **Rule of Three Direct**, where the firſt Number is Unity or 1.

The following Tables, containing the *Aliquot Parts* of a Shilling and of a Pound Money, the Learner ought to be well acquainted with.

	d.		*s.*
The even Parts of a Shilling	6	is	$\frac{1}{2}$
	4		$\frac{1}{3}$
	3		$\frac{1}{4}$
	2		$\frac{1}{6}$
	$1\frac{1}{2}$		$\frac{1}{8}$
	1		$\frac{1}{12}$

	s.	*d.*		*l.*
The even Parts of a Pound	10	0	is	$\frac{1}{2}$
	6	8		$\frac{1}{3}$
	5	0		$\frac{1}{4}$
	4	0		$\frac{1}{5}$
	3	4		$\frac{1}{6}$
	2	6		$\frac{1}{8}$
	2	0		$\frac{1}{10}$
	1	8		$\frac{1}{12}$
	1	0		$\frac{1}{20}$

Rules of Practice.

Caſe 1. When the Price of Unity is *Farthings*, under 4 take the *Aliquot parts* of a *Peny*, and the Sum will be Pence.

Example I.

What are 40 yds at $\frac{1}{4}$ *per* yd. worth ?

$\frac{1}{4}$ —

$\frac{1}{4}$ is $\frac{1}{4}$ of a *d.* 10 *d.* Anſwer.

Example II.

What will 32 *ll.* coſt at $\frac{1}{2}$ *per ll.*

$\frac{1}{2}$ —

$\frac{1}{2}$ is $\frac{1}{2}$ of a *d.* 16 *d.* Anſwer.

Example III.

What will 64 *Ells* coſt at $\frac{3}{4}$ *d. per Ell* ?

$\frac{1}{2}$ —

$\frac{1}{2}$ is $\frac{1}{2}$ of a *d.* 32

$\frac{1}{4}$ is $\frac{1}{2}$ of $\frac{1}{2}$ *d.* $\frac{1}{2}$ 16

—

48 *d.* Anſwer.

The Fourth of the firſt Example, Half of the ſecond, and three Fourths of the third, anſwer the Queſtions in Pence.

Caſ

Caſe 2 When the price of an Integer is an even part of a Shilling, divide the Number by the part, the Quotient is Shillings.

Example I.

At 2 *d. per Ell*, what coſt *696 Ells?*

$\frac{1}{6}$

2 *d.* is $\frac{1}{6}$ of a Shilling 116*s.* Anſwer.

Example II.

At 3*d. per yard*, what coſt 864 *yards ?*

$\frac{1}{4}$

3*d.* is $\frac{1}{4}$ of a Shilling 216 *s.* Anſwer.

Example III.

At 4 *d. per yard*, what coſt 564 *yards ?*

$\frac{1}{3}$

4 *d.* is $\frac{1}{3}$ of a Shilling 188 *s.* Anſwer

Example IV.

At 6 *d. per ll.* what coſt 453 *ll.*

$\frac{1}{2}$

6 *d.* is $\frac{1}{2}$ of a Shilling 226*s.* 6*d.* Anſwer.

The $\frac{1}{6}$ for 2 *d* in the firſt Example, $\frac{1}{4}$ for 3 *d.* in the ſecond Example, $\frac{1}{3}$ for 4 *d.* in the third Example, and $\frac{1}{2}$ for 6*d.* in the fourth, being taken, their Quotes anſwer each Queſtion in Shillings, and what remain are Pence.

Caſe 3. When the price of the Unite is any number of Pence under 12, and not the even part of a Shilling; divide by the ſeveral parts thereof, as in the following Examples.

Example I.

At 5 *d. per gall.* what coſt 1264 *gallons?*

			d.
4 *d.* is $\frac{1}{3}$ of a Shill.	$\frac{1}{3}$	421	4
1 *d.* is $\frac{1}{4}$ of 4*d.*	$\frac{1}{4}$	105	4
	s.	526	. 8 *d.* Anſ.

Example II.

At 7 *d. per ll.* what coſt 6768 *ll.*

6 *d.* is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$	3384	
1 *d.* is $\frac{1}{6}$ of 6 *d.*	$\frac{1}{6}$	564	
		3948 *s.*	Anſwer.

Example III.

At 8 *d. per Ell*, what coſt 5769 *Ells*?

6 *d.* is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$	2884	. 6
2 *d.* is $\frac{1}{3}$ of 6 *d.*	$\frac{1}{3}$	961	. 6
	s.	3846	. 0 Anſ.

Example

Example IV.

At *9 d. per Yard*, what coſt *47657 Yards?*

6 d. is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$ 23828 . 6
3 *d.* is $\frac{1}{2}$ of *6 d.*	$\frac{1}{2}$ 11914 . 3
	s. 35742 . *9d.* Anſ.

Example V.

At 10*s. per Barrel*, what coſt *5765* $\frac{3}{4}$ *Barrels?*

6 d. is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$ 2882 . *6*
4 *d.* is $\frac{1}{3}$ of a Shill.	$\frac{1}{3}$ 1921 . 8
	7 $\frac{1}{2}$ for $\frac{3}{4}$
	s. 4804 . *9* $\frac{1}{2}$ Anſ.

Example VI.

At 11 *d. per Hogſhead*, what coſt 7564 $\frac{1}{2}$ *Hhds.*

6 d. is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$ 3782
4 *d.* is $\frac{1}{3}$ of a Shill.	$\frac{1}{3}$ 2521 . 4
1 *d.* is $\frac{1}{4}$ of 4 *d.*	$\frac{1}{4}$ 0630 . 4
	5 $\frac{1}{2}$ for $\frac{1}{2}$
	s. *6934* 1 $\frac{1}{2}$ Anſ.

Example

Example VII.

At 7 *d. per Yard*, what coſt 75654 $\frac{1}{4}$ *Yards*?

6 *d.* is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$	37827
1 *d.* is $\frac{1}{6}$ of 6 *d.*	$\frac{1}{6}$	6304 . 6
		1 $\frac{3}{4}$ for $\frac{1}{4}$
	s.	44131 . 7 $\frac{3}{4}$ Anſw.

Caſe 4. When the Price of an Unit or Integer is Pence and Farthings under a Shilling, work for the Pence as before, and if the Farthings be an even part of the Pence you work'd by, take ſuch part of the Farthings; otherwiſe multiply the Number given by the Pence, and for the Farthings take the Aliquot parts of a Peny (as in **Caſe** 1.) the Quotient will be Pence.

Example I.

At 2 $\frac{1}{2}$ *per Yard*, what coſt 7567 $\frac{1}{2}$ *Yards*?

2 *d.* is $\frac{1}{6}$ of a Shill.	$\frac{1}{6}$	1261 . 2
$\frac{1}{2}$ *d.* is $\frac{1}{4}$ of 2 *d.*	$\frac{1}{4}$	315 . 3 $\frac{1}{2}$
		1 $\frac{1}{4}$ for $\frac{1}{2}$
	s.	1576 . 6 $\frac{3}{4}$ Anſw.

Example II.

At 3 *d* $\frac{3}{4}$ *per Ell*, what coſt 5774 *Ells* ?

3 *d.* is $\frac{1}{4}$ of a Shill.	$\frac{1}{4}$	1443 . 6
$\frac{3}{4}$ is $\frac{1}{4}$ of 3 *d.*	$\frac{1}{4}$	360 . 10 $\frac{1}{2}$
	s.	1804 . 4 $\frac{1}{2}$ Anſwer

Example III.

At 5 *d.* $\frac{1}{2}$ *per ll.* what coſt 756 *ll.* ?

4 *d.* is $\frac{1}{3}$ of a Shill.	$\frac{1}{3}$	252
1 *d* is $\frac{1}{4}$ of 4 *d.*	$\frac{1}{4}$	63
$\frac{1}{2}$ *d.* is $\frac{1}{2}$ of 1 *d.*	$\frac{1}{2}$	31 . 6
	s.	346 . 6 Anſwer.

Example IV.

At 11 *d.* $\frac{3}{4}$ *per Yard* what coſt 45756 *yards* ?

6 *d.* is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$	22878
4 *d* is $\frac{1}{3}$ of a Shill.	$\frac{1}{3}$	15252
1 *d.* is $\frac{1}{4}$ of 4 *d.*	$\frac{1}{4}$	3813
$\frac{1}{2}$ is $\frac{1}{2}$ of 1 *d.*	$\frac{1}{2}$	1906 . 6
$\frac{1}{4}$ is $\frac{1}{2}$ of $\frac{1}{2}$	$\frac{1}{2}$	953 . 3
	s.	44802 . 9 Anſw.

Otherwiſe thus:

45756 *Yards*
11

45756
45756

$\frac{1}{2}$ *d*. is $\frac{1}{2}$ a Peny — 503316
$\frac{1}{4}$ *d*. is $\frac{1}{2}$ of $\frac{1}{2}$ *d*. — $\frac{1}{2}$ 22878
$\frac{1}{2}$ 11439

---

12)537633

44802 . 9 *d*.

Caſe 5. When the price of the Unit is an even Number of Shillings under 20, take half the given price of the Integer, and thereby multiply the Number given, doubling the firſt Figure that ſhould be ſet down in the Product for Shillings, and carry the Tens to the Product of the next Figure for Pounds.

Example I.

What coſt 57654 *Yards* at 4 *s*. *per Yard*?
2

---

l. 11530.16 Anſw.

Example

Example II.

What coſt 47573 *Ells* at *6 s. per Ell ?*
3

l. 14271.18 Anſw.

Example III.

What coſt 547698 *Gallons* at 10 *s. per Gallon ?*
5

l. 273849.0 Anſw.

Eample IV.

What coſt 5764 *C.* at 16 *s. per C.*
8

l. 4611.4 Anſw.

Example V.

What coſt 47632 ½ *Yards* at 18 *s. per Yard ?*
9

l. 42868.16
+ 9 for the ½

l. 42869..5 Anſwer

Caſe 6. When the Sum given is Shillings and Pence (under 20 *s.*) for the price of the Integer, if the price be an even part of a Pound divide by the Aliquot part, the Quotient is Pounds; if uneven, multiply by the Shillings and work for the Pence (as in **Caſe** 3.) and you have the Anſwer in Shillings.

Example I.

What is the price of 48 *ll.* at 3 *s.* 4 *d. per ll.*

$\frac{1}{6}$ ———

3 *s.* 4 *d.* is $\frac{1}{6}$ of *l.* 8 *l.* Anſwer

Example II.

What is the price of 56 *Yds.* at 6 *s.* 8 *d. per Yds*

$\frac{1}{3}$ ———

6 *s.* 8 *d.* is $\frac{1}{3}$ of a *l.* *l.* 18 *l.* 13 *s.* 4 *d.* Anſwer

Example III.

At 4 *s.* 9 *d. per Gallon,* what coſt 4756 *Gallons*?

4

19024

6 *d.* is $\frac{1}{2}$ of a Shill. $\frac{1}{2}$ 2378

3 *d.* is $\frac{1}{2}$ of 6 *d.* $\frac{1}{2}$ 1189

2|0)2259|1 *s.*

Anſwer, 1129 *l.* 11 *s.*

Example

Example IV.

At 11 *s.* 10 *d. per* C. what coſt 147594 C.?

		11
		147594
		147594
		1623534
6 *d.* is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$	73797
4 *d.* is $\frac{1}{3}$ of a Shill.	$\frac{1}{3}$	49198
		2|0)174652|9 *s.*
		Anſwer, 87326*l.* 9 *s.*

Example V.

At 12 *s.* 6 *d. per Tun*, what coſt 1234 $\frac{1}{4}$ *Tun*?

		12
		14808
6 *d.* is $\frac{1}{2}$ of a Shill.	$\frac{1}{2}$	617
		3 . 1 $\frac{1}{2}$ for $\frac{1}{4}$
		s. 15428 . 1 $\frac{1}{2}$ Anſ.

Caſe 7. When the price of the Integer is Pounds multiply the Number given thereby, the Product is the Number of Pounds.

Example I.

At 4 *l. per C.* what coſt 4757 *C.* ?
4

l. 19028 Anſwer

Example II.

At 6 *l. per Tun*, what coſt 567 *Tun* ?
6

l. 3402 Anſwer

Example III.

At 8 *l. per Ell*, what coſt 7098 ½ *Ells* ?
8

l. 56788 Anſwer

Example IV.

At 11 *l. per Yard*, what coſt 749 *Yards* ?
11

749
749

l. 8239 Anſwer

Caſe 8. If the price of the Unit happen to be Pounds, Shillings, Pence and Farthings; multiply the given Quantity by the Pounds, and to that Product add the parts that the Shillings, Pence and Farthings come to.

Example I.

At 2 *l.* 5 *s.* 11 *d.* $\frac{1}{2}$ *per Ell*, what coſt 154 *Ells*?

		2		
		308	*s.*	
5 *s.* is $\frac{1}{4}$ of a Pound	$\frac{1}{4}$	38	10	
10 *d.* is $\frac{1}{6}$ of 5 *s.*	$\frac{1}{6}$	6	8	4
1 *d.* is $\frac{1}{10}$ of 10 *d.*	$\frac{1}{10}$		12	10
$\frac{1}{2}$ *d.* is $\frac{1}{2}$ of 1 *d.*	$\frac{1}{2}$		6	5
Anſwer,	*l.*	353	17	7

Example II.

At 3 *l.* 16 *s.* 11 *d.* $\frac{1}{4}$ *per Yard*, what coſt 756 *Yards*?

		3		
		2268		
10 *s.* is $\frac{1}{2}$ of a Pound	$\frac{1}{2}$	378		
5 *s.* is $\frac{1}{2}$ of 10 *s.*	$\frac{1}{2}$	189	*s.*	*d.*
1 *s.* 3 *d.* is $\frac{1}{4}$ of 5 *s.*	$\frac{1}{4}$	47	5	0
7 *d.* $\frac{1}{2}$ is $\frac{1}{2}$ of 1 *s.* 3 *d.*	$\frac{1}{2}$	23	12	6
$\frac{3}{4}$ *d.* is $\frac{1}{10}$ of 7 *d* $\frac{1}{2}$	$\frac{1}{10}$	2	7	3
Anſwer,	*l.*	2908	4	9

Example III.

At 3 *l.* 14 *s.* 6 *d.* ½ *per Ell*, what coſt 543 *Ells* ?

		3		
		1629.	*s.*	
10 *s.* is ½ of a Pound	½	271	10	
4 *s.* is ⅕ of a Pound	⅕	108	12	
6 *d* is ⅛ of 4 *s.*	⅛	13	11	6
½ *d.* is 1/12 of 6 *d.*	1/12	1	2	7½
	Anſwer, *l.*	2023	16	1½

Example IV.

At 4 *l.* 16 *s.* 10 *d. per C.* what coſt 327C 3*qrs.* 18*ll.*

					4		
					1308	*s.*	
For	10 *s.* 0 *d.*	take	½ of a *l.*	½	163	10	
	6 8		⅓ of a *l*	⅓	109	00	*d.*
	2		1/40 6*s* 8*d*	1/40	2	14	6
For	2 *qrs.*	take	½ *C.*	½	2	8	5
	1 *qr.*		½ that	½	1	4	2½
	14 *L.*		½ that	½		12	1¼
	4 *L.*		⅐ of ¼ *C.*	⅐		3	5½
				Anſwer, *l.*	1587	12	8¼

Practice by Multiplication.

IN **Practice** by **Multiplication**, you find two or more Numbers, whoſe Product will be equal to the Numbers given.

Example.

56 ll. of Butter, at *5 d.* ½ *per ll.?*

7

---

38 ½   7×8=56
8

Anſwer, 308 *d.*

7×8=56. *Firſt* multiply the Price by 7, and the Product by 8 anſwers the Queſtion; but when the Number does not exactly hit either, multiply it by or add to it a Figure that will make the Number.

Example I.

At 2 *l.* 17 *s.* 6 *d.* ¾ *per* C. what coſt 567 C?
9×7=63×9=567

	25	18	0	¾	
				7	
	181	6	5	¼	
				9	
l.	1631	17	11	¼	Anſwer

Example II.

At 19 *s.* 8 *d.* ¾ *per Yard*, what coſt 91 *Yards*?
10×9=90+1=91

	9	17	3	½	
				9	
	88	15	7	½	
		19	8	¾	
l.	89	15	4	¼	Anſwer

Simple

CHAP. XI.

Simple Intereſt

IS that **Intereſt** which is paid for the Uſe or Loan of any Sum of Money, put out or lent for a Time, at ſome certain Rate *per Cent. per Annum*. The Laws of *England* allow the Lender to take but *6 l.* for the Uſe of 100 *l.* for a year, and proportionably for a greater or leſſer Sum or Time.

When the Principal, Time of its being at Intereſt, and the Rate of Intereſt *per Cent. per Annum* are given, to find the Intereſt and amount.

RULE.

Multiply the Principal, the Time, and the Ratio of the Rate, all three into each other, and their Product will be the **Intereſt**. To which if you add the Principal, the Sum will be the Amount.

Example I.

What Sum will *79 l.* amount to in a Year, at the rate of *6 l. per Cent. per Annum?*

79 l.
× 1 year

79
× ,06

*l.*4,74 Intereſt

That is, *l.* 4,74 or 4 *l.* 14 *s.* 9 *d.* $\frac{1}{2}$ is the Intereſt of 79 *l.* for one year.

Then 4 *l.* 14 *s.* 9 *d.* $\frac{1}{2}$ + 79 *l.* = 83 *l.* 14 *s.* 9 *d.* $\frac{1}{2}$ the Amount.

Example II.

What will *672 l. 13 s. 9 d.* amount to in one Year at *6 l. per Cent. per Annum?*

672 *l.* 13 *s.* 9 *d.*
,06

40,36 2 6
20

7,22
12

2,70
4

2,80

In the ſecond *Example* I have not multiply'd by 1, (which I did before, to keep up to the Rule) becauſe 1 neither multiplies nor divides, *&c.* and for the *Decimals* in the *Ratio* of the Rate, have cut off 2 *Decimals*, and left 40 *l.* then multiply'd the 36, ſo cut off, by 20, 12 and 4, taking in the odd Money where proper, and find the Intereſt to be 40 *l.* 7 *s.* 2 *d.* ½, which when added to the Principal 672 *l.* 13 *s.* 9*d.* is 713 *l.* 0 *s.* 11 ½, the Amount.

Example III.

What will 509 *l.* 10 *s.* amount to in 6 years, at 5 *l.* *per Cent. per Annum ?*

```
509 l. 10 s. 00 d.
             ,05
------------------
25,47 . 10 . 00
              6
------------------
152,85 . 00 . 00
```

That is, 509*l.* 10*s.* amounts to in one Year, at 5 *l.* *per Cent. per Ann.* 25 *l.* 9 *s* . 6 *d* then ſix Years muſt be ſix times as much, that is 152 *l.* 17 *s.* which added to 509 *l.* 10 *s*, the Principal =662 . 7. the Amount.

Example IV.

What will 769 *l.* 18 *s.* 4 *d.* come to at 6 *per Cent. per Annum* for 9 Months?

	769 *l.*	18 *s.*	4 *d.*
		,06	
	46,19	10	0
For 3 Months take ¼ and deduct from 12 months	11,54	17	6
	34,64	12	6
	20		
	2,92		
	12		
	1,10		

Anſwer 34 *l.* 12 *s.* 11 *d.*

When the Time is 3 Months, take ¼ of the Intereſt for a Year, being the Intereſt for that time, and for 6 Months ½; but when 9 Months, take ¼, and deduct it from the Intereſt of a Year, the Remainder will be the Intereſt for 9 Months.

When

When **Intereſt** is to be caſt up **by Days.**

1. REDUCE the **Principal Money** into **Pence.**

2. Multiply thoſe **Pence** by the **Days** the Principal Money is at Intereſt.

3. For 3 *per Cent. per Annum* divide the laſt Product by 12166; for 4 *per Cent.* by 9125: for 5 by 7300; for 6 by 6083; (for thoſe are the Days in a Year multiply'd by 100, and divided by the Rate of Intereſt, at which the Money was put out) and the Quotient is the Intereſt in Pence, as in the following Examples.

Example I.

What will *67 l.* 10 *s.* amount to in 190 days, at *6 l. per Cent. per Annum?*

```
              67 l. 10 s.
                 20
               -----
              1350
                12
             -------
             16200
               190
            --------
            1458000
            16200
            --------
      6083)3078000
                ...
      ------
   12)506    36500
      ------ ------
   2|0)4|2.2     2
       ------
     l. 2.2.2
```

Anſwer, 2 *l.* 2 *s.* 2 *d.* Intereſt + *67 l.* 10 *s.* Principal = *69 l.* 12 *s*, 2 *d.*

Example

Example II.

What will 527 *l.* 12 *s.* 6 *d.* amount to in 320 days, at 3 *l. per Cent. per Annum?*

```
              527 l. 12 s. 6 d.
                  20
              ------
              10552
                  12
              ------
             126630
                 320
             -------
      [illegible]532600
             379890
             -------
      12166)40521600
      ------    ....
12)3330     40236
   -----     37380
2|0)27|7.6    8820
   ---        ----
l.  13 17 6   8820
```

The Intereſt of 527 *l.* 12 *s.* 6 *d.* is 13 *l.* 17*s.* 6*d* which, when added to the Principal, amounts to 541 *l.* 10 *s.* in 320 Days, at 3 *l per Cent. per Ann.*

Example III.

What will 426 *l.* 10 *s.* 10 *d.* amount to in 23 Days, at 4 *l. per Cent. per Annum*?

426 *l.* 10 *s.* 10 *d.*
20

8530
12

102370
232

204740
307110
204740

9125)23749840
. . . .

12)2602   54998
24840

2|0)21|6.10   6590

l. 10.16.10

	l.	*s.*	*d.*	
	10	16	10	Intereſt
+	426	10	10	Principal
=	437	7	8	Anſwer.

Example IV.

What will 740 *l.* 5 *s.* 4 *d.* amount to in 311 Days, at 5 *l. per Cent. per Annum.*

```
           740 l. 5 s. 4 d.
                20
           --------
             14805
                12
           --------
            177664
               311
           --------
            177664
           177664
           532992
           --------
    73|00)552535|04
    ----    ....
 12)7568     415
   -----     503
  2|0)63|0.8   655
     ----    ----
  l. 31.10.8    71
```

l.	*s.*	*d.*	
31	10	8	Intereſt
+740	5	4	Principal
=771	16	0	Amount

The former Examples at *6*, *3*, 4 and 5 *per Cent. per Annum*, for caſting up Intereſt by Days, have their reſpective *Diviſors* prepared in the 169*th* Page of this Book; and the *Diviſors* for the following *Examples* are,

5214 for 7 *per Cent. per Annum*
4562 for 8
4055 for 9
3650 for 10
3318 for 11
3091 for 12

Example

Example V.

What will 120*l* 10*s.* 11*d.* amount to in 157 Days, at 7*l. per Cent. per Annum?*

```
              120 l. 10 s. 11 d.
               20
             ------
             2410
               12
             ------
            28931
              157
             ------
           202517
          144655
          28931
         --------
      5214)4542167
               ...
    12)871   37096
              5987
  2|0)7|2.7  -----
               773
   l. 3.13.7
```

	l.	s.	d.	
	3	12	7	Intereſt
+	120	10	11	Principal
=	124	3	6	Amount

Example VI.

What will 450 *l.* 10 *s.* amount to in 255 days at 8 *l. per Cent. per Annum?*

```
                 450 l. 10 s.
                        20
                     ------
                      9010
                        12
                    ------
                    108120
                       255
                    ------
                    540600
                   540600
                  216240
                  --------
           4562)27570600
                     ....
       -----
   12)6043          19860
       -----         16120
 2|0)50|3.7         ------
       —              2434
   l. 25.3.7
```

	l.	*s.*	*d.*	
	25	3	7	Interest
+	450	10	0	Principal
=	475	13	7	Amount

Example

Example VII.

What will 767 *l.* 1 *s.* 6 *d.* amount to in 342 days, at 9 *l. per Cent. per Annum?*

```
                 767 l. 1 s. 6 d.
                     20
                 --------
                  15341
                     12
                 --------
                 184098
                    342
                 --------
                 368196
                736392
               552294
               ---------
        4055)62961516
              .....
  --------
  12)15526   22411
  --------   21365
2|0)129|3. 10  10901
  -----        27916
l. 64. 13. 10  ------
                3586
```

l.	s.	d.	
64	13	10	Intereſt
+767	1	6	Principal
=831	15	4	Amount

Example VIII.

What will *940 l. 15 s. 6 d.* amount to in 304 days, at 10 *l. per Cent. per Annum*?

940 l. 15 *s.* 6 *d.*
20

18815
12

225786
304

903144
6773580

365|0)6863894|4

12)18805 3213
2938
2|0)156|7.1 1894

l. 78.7.1 69

	l.	*s.*	*d.*	
	78	7	1	Intereſt
+	940	15	6	Principal
=	1019	2	7	Amount

Example IX.

What will 310 *l.* 6 *s.* 8 *d.* amount in 340 days, at 11 *l. per Cent. per Annum*?

310 *l.* 6 *s.* 8 *d.*
20

6206
12

74480
340

2979200
223440

3318)25323200

12)7632 20972
10640
2|0)63|6 6860

l. 31.16.0 224

	l.	*s.*	*d.*	
	31	16	0	Intereſt
+	310	6	8	Principal
=	342	2	8	Amount

Example X.

What will 856 *l.* 19 *s.* 11 *d.* amount to in 329 days at 12 *l. per Cent. per Annum*?

```
                      856 l. 19 s. 11 d.
                       20
                     ------
                      17139
                         12
                     ------
                     205679
                        329
                    -------
                    1851111
                   411358
                  617037
                  --------
            3041)67668391
                     .....
  12)22252         6848
                    7663
 2|0)185|4.4       15819
                     6141
   l. 92.17.4       ----
                       59
```

l.	*s.*	*d.*	
92	17	4	Intereſt
+856	19	11	Principal
=948	17	3	Amount.

F I N I S.

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